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# *Hamilton Bailey's Demonstrations of Physical Signs in Clinical Surgery*

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EDITED BY

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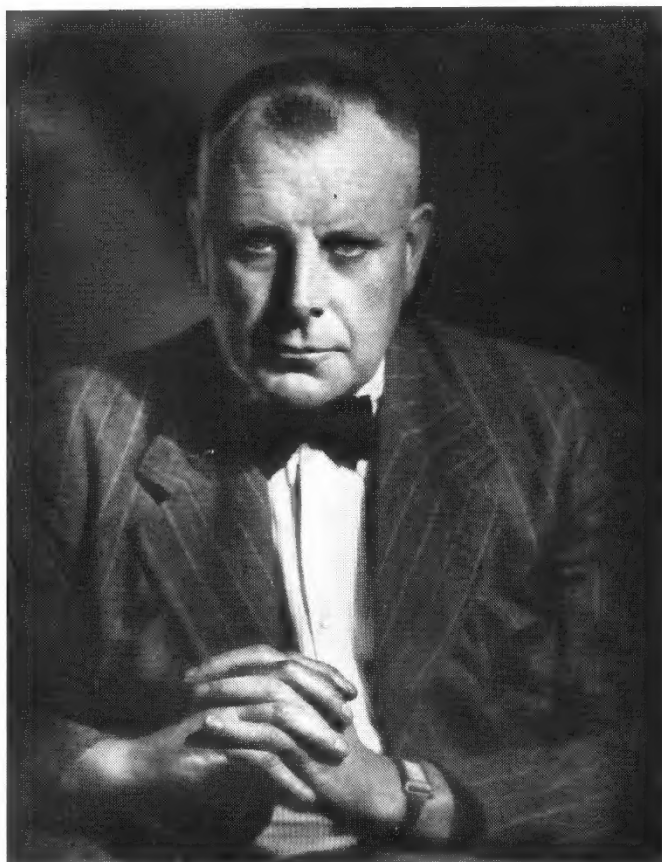
FIFTEENTH EDITION

Three hundred and seventh thousand

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1973



HAMILTON BAILEY  
1894-1961

BORN in Bishopstoke, Hampshire, where his father was a general practitioner, Henry Hamilton Bailey grew up in Southport, Eastbourne, and Brighton, where his father was successively in practice. His mother was a nurse, so not surprisingly he became a medical student at the London Hospital at the early age of sixteen, after schooling at St. Lawrence College, Ramsgate.

At the outbreak of the First World War he was a fourth-year medical student, and volunteered for the Red Cross, being dispatched with the British Expeditionary Force to Belgium. Almost inevitably he was taken prisoner-of-war and set to work on the German railways. A troop train was wrecked and Bailey, with two Frenchmen, was held on a suspicion of sabotage. One of the latter was actually executed but Bailey was reprieved (apparently by the good offices of the American Ambassador in Berlin) and repatriated via Denmark, where he continued his medical studies for a while.

In 1916 he joined the Royal Navy as a Surgeon-Probationer, serving in H.M.S. *Iron Duke* at the battle of Jutland. During the battle he helped with casualties in near darkness, the electricity supply being damaged for most of the action. While in the Navy he qualified, and later returned to the London Hospital, where he gained

the F.R.C.S. (Eng.) in 1920. During his period as surgical registrar at the London Hospital he pricked his left index finger, and tendon-sheath infection, a common sequel in those days, ensued. The end-result was an amputation of the stiff finger (this can be seen in several illustrations in this book), but he soon overcame the disability.

Appointments as Assistant Surgeon at Liverpool Royal Infirmary (1921), Surgeon to Dudley Road Hospital, Birmingham (1926), and finally as Surgeon to the Royal Northern Hospital, London (1930), followed.

In a quarter of a century Bailey produced this work, his *Emergency Surgery*, and *Short Practice of Surgery* (jointly with R. J. McNeill Love, a contemporary surgical registrar at the London Hospital), edited *Surgery of Modern Warfare* during the Second World War, and revitalized *Pye's Surgical Handicraft*. These were his most successful works; all rapidly attained a wide circulation with many editions, and it has been said '... it will readily be conceded that the present excellence of illustrations in medical text-books owes much to his inspiration and striving for perfection'. In addition to these major contributions, he wrote over 130 original papers and 9 other books.

All this, together with a busy practice, particularly in surgical emergencies, was too much even for Hamilton Bailey's massive frame, and in 1948 he suffered a breakdown in health, aggravated, no doubt, by the death of his only child, a son, in a railway accident in 1943. He retired to Deal, Kent, and later to Malaga, Spain, but continued his literary work. He died of carcinoma of the colon, and is buried in the peaceful little English cemetery in Malaga. His missionary zeal for teaching medical students has been perpetuated by the use of the royalties from his books to expand medical school libraries in developing countries.

## PREFACE TO THE FIFTEENTH EDITION

To be asked to edit the fourteenth edition of this work, the first to appear after Hamilton Bailey's death, was a great honour. For that edition, as he would have done, I read all the available reviews of the previous edition, and similarly I have perused the reviews of the fourteenth edition prior to this revision. I am grateful for much constructive criticism offered by many reviewers.

*Demonstrations of Physical Signs* is intended primarily for the medical student commencing clinical studies, and for him it is sufficient to read the sections in ordinary type. Small-print sections are intended for postgraduates. This does not apply to the medical student in the tropics, for whom some of the small-print sections are basic. In recent years many new medical schools have been inaugurated in many parts of the world, particularly in the tropics. Consequently descriptions of physical signs of surgical importance in tropical diseases have been expanded and increased numerically and these are listed in a new Appendix.

The order of the chapters has been drastically rearranged to divide the book into five sections which, it is hoped, will be helpful to the student in a systematic study of clinical surgery.

Throughout the work alterations have been made, where necessary, to adopt the recommendations of the Committee of the American Academy of Orthopaedic Surgeons on Methods of Measuring and Recording Joint Motion. It is my hope that the demonstrations of orthopaedic abnormalities will provide a sound clinical basis for the trainee in orthopaedic surgery.

There are those who hold that the zenith of surgical diagnosis by clinical methods of examination has been reached. However, in this edition new material and illustrations demonstrating diagnostic signs in the following conditions among others have been added: 'Deformity', 'Scars', 'Traumatic Intracranial Vascular Lesions', 'Orbital Blow-out Fracture', 'Choanal Atresia', 'Arterial Obstruction in the Neck', 'Subclavian Steal Syndrome', 'de Quervain's Thyroiditis', 'The Syndrome of Cyanosis on Feeding a New-born Baby', 'Traumatic Rupture of the Aorta', 'Dysphagia Lusoria', 'Food Bolus Obstruction', 'Mesenteric Ischaemia', 'Laxity of Ligaments', 'Grease Gun Injuries', and 'Tarsal Tunnel Syndrome'. Rigorous pruning of obsolete material has made it possible to reduce the size of the book slightly.

Grateful acknowledgement is given on pp. ix-x to surgeons the world over for borrowed illustrations used in this edition, without which the book could not have reached its foremost position, and for other help. Colleagues at Dudley Road Hospital especially have been generous in allowing me the use of their clinical illustrations. In addition, I am most grateful to Mrs. Hamilton Bailey for a great deal of helpful advice. The Publishers have provided their usual meticulous standard of special technical skill with which many readers will be familiar already.

Edgbaston  
Birmingham

ALLAN CLAIN

## FROM THE PREFACES TO THE FIRST TO THIRTEENTH EDITIONS

THERE is a growing tendency to rely upon laboratory and other auxiliary reports for a diagnosis. A former chief was wont to picture the modern graduate of medicine, when summoned to an urgent call, driving up to the patient's house followed by a pantechicon containing a fully equipped X-ray installation, and a laboratory with a staff of assistants. Without these aids the future doctor would be unable to formulate a diagnosis. The history, and physical methods of examination, must always remain the main channels by which a diagnosis is made.

Written originally for the student commencing clinical work in the surgical wards and the out-patient department, it is to him or her that this book is still principally addressed. Couched in language that should be understood easily by anyone who has been trained in anatomy and physiology, when a term with which the beginner is unlikely to be familiar is introduced, its meaning and derivation are explained.

When I have felt not fully competent to speak from personal experience, I have studied the relative literature and sought advice from those who are better able to assess the value of particular physical signs than myself.

Individual physical signs are often known by the name of the person who first described them. In many respects this is an advantage, for an anatomico-pathological label is often cumbersome. On the other hand, an array of proper names is apt to bore the reader, especially if they do not conjure up personalities. By adding historical footnotes, not only is this objection overcome without lengthening the text, but due credit is given to whom we owe so much. If the reader is not interested, the footnotes can be disregarded.

The book has never presumed to be a complete treatise on clinical surgery; its scope is clearly set out in Chapter I. I have always intended it to be what its name implies—demonstrations—hence the pictures.

HAMILTON BAILEY

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# DEMONSTRATIONS OF PHYSICAL SIGNS IN CLINICAL SURGERY

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## CHAPTER I

### INTRODUCTION

THE making of a surgical diagnosis resolves itself into seven stages—often not more than three or four of these will be found necessary.

1. A history is taken and a general observation of the patient is made.
2. Physical signs are elicited.
3. A mental process takes place on the part of the surgeon, whereby (1) and (2) are sifted and correlated, and a logical conclusion is drawn.
4. A differential diagnosis is entertained: this is also a mental process—largely one of exclusion, but reinforced, when possible, by further physical signs.
5. The more accessible parts of the interior are rendered visible by ingeniously constructed instruments, such as the cystoscope, sigmoidoscope, bronchoscope, oesophagoscope, and gastroscope.
6. Confirmatory investigations—e.g., radiological, biochemical, bacteriological—are carried out, usually by a colleague.
7. A biopsy or an exploratory operation is performed.

If a diagnosis is still found wanting after the seven stages have been exploited two possibilities remain: Nature cures the patient of his disease, and the diagnosis is for ever one of surmise; or he dies, and a post-mortem, the final court of appeal, if performed, reveals the exact pathology.

The seven stages may be termed the 'surgical crescendo'. *It is mainly with the second stage and the latter part of the fourth that this book is concerned.*

"Data, Data, Data!" cried Sherlock Holmes. "I can't make bricks without clay."\* In the demonstrations that follow an earnest endeavour has been made to train the student to elicit and assemble facts upon which to formulate a reasoned diagnosis.

Another important objective of this book is to bring before the reader selected patients with surgical conditions for demonstration, so that not only can a physical sign or signs be sought, but in a number of instances attention can be drawn to some characteristic feature or to some syndrome† that is helpful in arriving at a diagnosis.

Not all the patients presented suffer from conditions that will be encountered frequently. In this connexion it must be pointed out that whereas a particular

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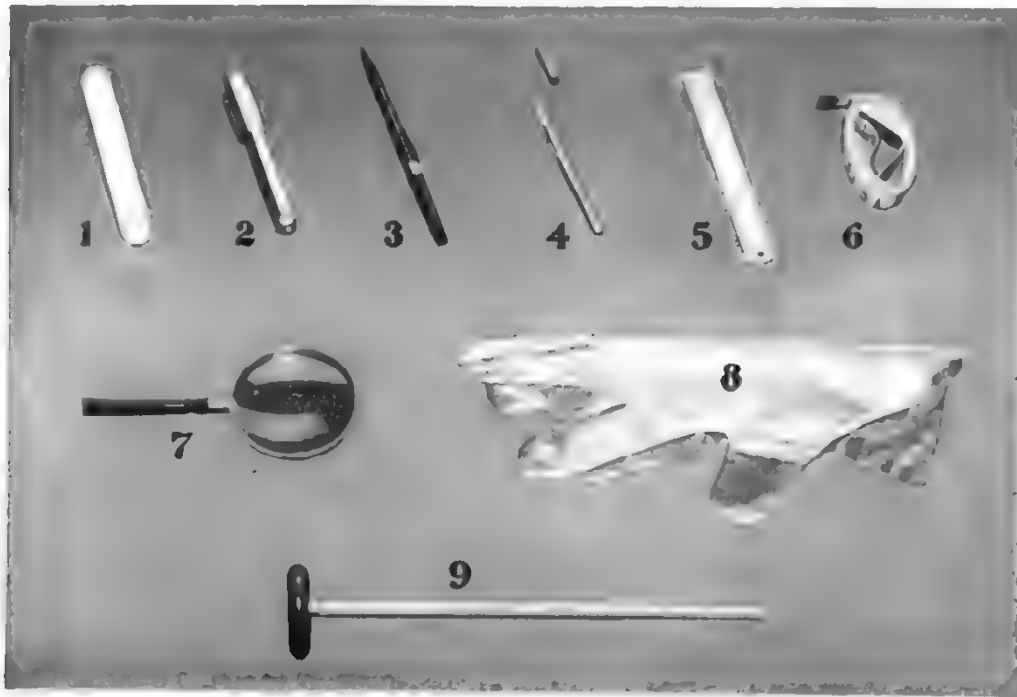
\* *The Copper Beeches*, Sir Arthur Conan Doyle.

† *Syndrome*. Greek, *συνδρομή* = concurrence: an aggregation of symptoms and physical signs that collectively constitute a clinical entity. When, as is often the case, there are three leading criteria, the alternative term 'triad' is sometimes employed (e.g., Hutchinson's triad, p. 89).

disease is rare in one part of the world, sometimes it is not so uncommon in another. Also it is possible that the reader, having seen an illustration and having read the corresponding text, sometimes will be enabled to make a correct diagnosis in spite of the fact that never before had he or she encountered the condition.

**Armamentarium.**—A few simple instruments are necessary; their cost is small. Practically all the apparatus employed in the tests described in this work is shown in *Fig. 1*.

To become a competent up-to-date clinician, the student and the practitioner must become familiar with the use of rectal, vaginal, and nasal specula, together with the auroscope, ophthalmoscope, and laryngeal mirror. In spite of requests to do



*Fig. 1.*—Apparatus used for diagnostic purposes in this book. 1, Wooden tongue depressor; 2, Electric pocket torch; 3, Skin marking pen; 4, Clinical thermometer; 5, Metal ruler; 6, Linen tape-measure; 7, Magnifying glass; 8, Disposable glove; 9, Tendon hammer.

so, no attempt to demonstrate the use of these important aids to diagnosis has here been made because: (1) it is considered that this is beyond the scope of physical signs; (2) an adequate description of this aspect of clinical surgery would greatly increase the size of the book.

**Note-taking.**—Accurate records are essential. The history, which may be all-important in suggesting the diagnosis, should be noted. For the artistically inclined a sketch is a good method of documenting the physical signs. For those not so gifted rubber stamps (*Fig. 2*) are useful.

**The Boundaries of Surgical Diagnosis.**—The expanding frontiers of surgical treatment have caused specialist surgeons to require an understanding of the intricacies of medical diagnosis *in their particular domains*. Thus the neurosurgeon must be able to confirm the physical signs of, say, a cerebral tumour. The chest surgeon needs the ability to recognize the signs of a heart lesion amenable to surgical treatment. However, the patient is examined initially by the relevant medical specialist who correlates the (sometimes complex) specific investigations necessary.

It is felt that physical diagnosis falling within such spheres is beyond the compass of this work, which is intended for the medical student and the trainee surgeon. The former will be instructed by those responsible for imparting the elements of medical diagnosis; the latter, if intending to specialize, should acquire

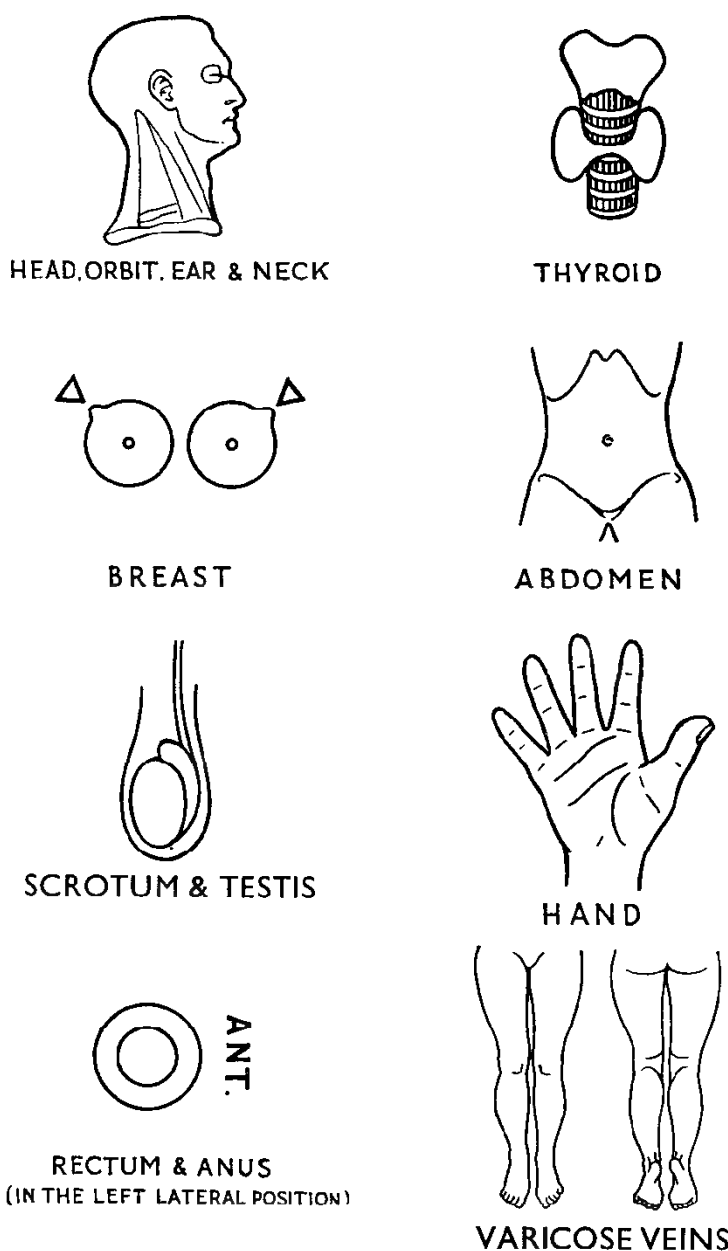


Fig. 2.—Examples of rubber-stamps used for recording physical signs.

the requisite knowledge during his training by surgeons in the speciality. Attention will thus be confined to the territory of what is usually regarded as general surgery *in the wider sense*. Gynaecological diagnosis is thus excluded, but genito-urinary and orthopaedic surgery are included.

## CHAPTER II

### BASIC PHYSICAL SIGNS

BEFORE commencing to describe individual physical signs, let us, as it were, tune up by harping for a moment on that fundamental principle of clinical surgery—*comparison*. When it is possible to compare an injured or diseased member or side with the corresponding normal member or side (*Fig. 3*), the opportunity should be seized greedily. Throughout the book it is hoped that this principle will be observed studiously by the reader.



*Fig. 3.*—The left arm is slightly swollen and enlarged veins are visible on that side. Case of spontaneous thrombosis of the axillary vein. An example of the value of comparison.

Another fundamental principle is, after concluding the examination of a local inflammatory or neoplastic lesion, *remember the regional lymphatic field*. This should become so inculcated in the clinician that it comes, not as an afterthought, but as a reflex. Conversely, when a lymph-node (or group of lymph-nodes) is found to be enlarged, the primary focus must be sought. He who fails to heed these injunctions helps to swell the numbers who do not satisfy the examiners at the final examination in surgery; such omissions are also a cause of many embarrassing mistakes in professional practice.

#### INCIDENTAL OBSERVATION OF THE FACE AND HANDS

‘You are looking better’; even a layman can discern signs in the face that portray improvement in a patient’s condition. There is no doubt that the experienced clinician subconsciously makes more use of observing the facies than he is inclined to realize.

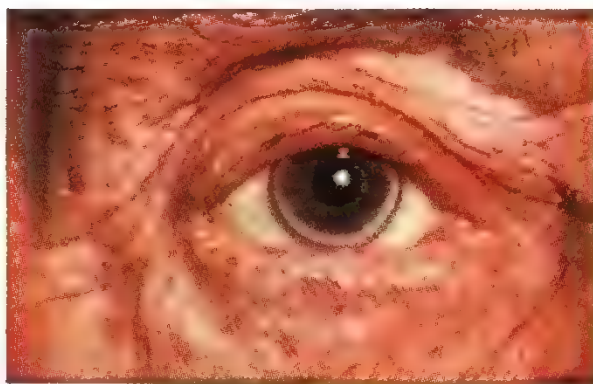
A glance at the face of a patient who has been seen before will often indicate (without the aid of other methods of examination) whether the condition from

which he is suffering is responding to treatment. Important as is this relative assessment, we are concerned here particularly with the first glance at the face of a patient seen for the first time (*Fig. 4*). The general diagnostic importance of the facies is enormous, but unfortunately much that can be learned from it cannot be put into words.

The eyes—those windows of the mind\*—tell much, but not as much as once was thought (*Fig. 5*). Even the way the patient looks at you while he recounts his history may reveal sincerity or shiftiness. Slight bulging of the eyeballs, especially if combined with a nervous manner, should foretell the necessity of excluding



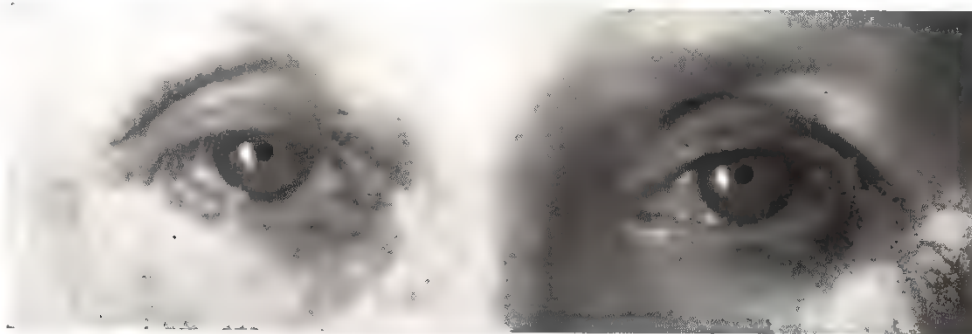
*Fig. 4.*—In the absence of a history of trauma, ptosis not present since birth (3rd nerve paralysis) should suggest cerebrospinal syphilis. This patient's Wassermann reaction was strongly positive.



*Fig. 5.*—So-called Arcus Senilis. While this undoubtedly becomes commoner with advancing age, it is not unduly associated with atherosclerosis, hypertension, myocardial infarction, stroke, or diabetes. It is relatively common in those of African descent.

hyperthyroidism in due course. Pin-point pupils, or at least small pupils (*Fig. 6*), suggest tabes dorsalis or narcotic drug addiction.

A faint yellow tinge of the sclerae, unnoticed by others, may be apparent in good daylight to a trained observer. In electric light even moderate jaundice may be missed.



*Fig. 6.*—'Pin-point', slightly irregular pupils were noticed as this patient was giving her history of 'being unable to hold her water'. The pupils gave the Argyll Robertson reaction.† Knee-jerks were absent. Diagnosis—incontinence of urine due to tabes dorsalis.

In the heyday of life there is some foundation for the popular idea that bagginess under the eyes is a sign of debauchery; more often it is of ominous clinical significance (*Figs. 7, 8*).

\* 'Mistress, look on me; Behold the window of my heart, mine eye.' Shakespeare, *Love's Labour's Lost*, V. 2. 848.

† Absence or diminution of the pupillary reflex to light but an active contraction to near vision.

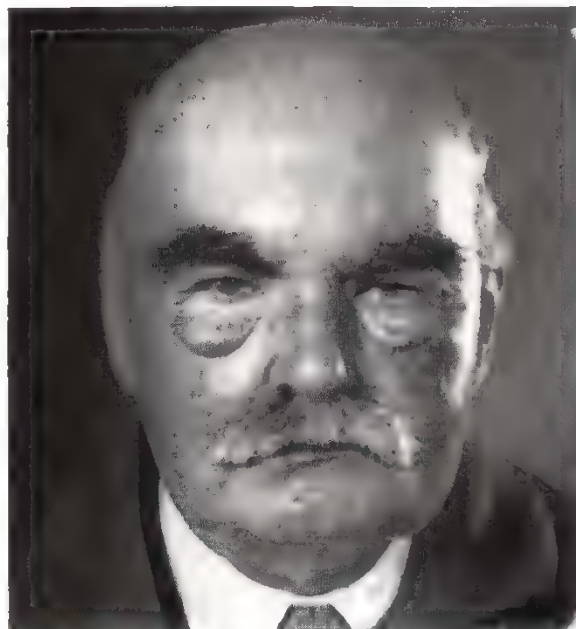


Persons with acne rosacea or with polycythaemia rubra vera (*Fig. 9*) are liable to go through life branded as secret drinkers, an unwarranted assumption.

'Is he weather-beaten, or is it a faint cyanotic tinge?' We look at the nail-beds to determine this point. The patient has a bull-dog jaw and heavy features, suggesting acromegaly (*Fig. 10*). He is requested to hold up his hands; spade-like hands (*Fig. 11*) confirm the suspicion. Regarding the hands one does not need the mysteries of palmistry to read in them something of the past, a great deal of the present, and



*Fig. 7.*—In addition to bagginess under her eyes this patient had very dry skin and a sallow complexion. Case of myxoedema (*see p. 160*).



*Fig. 8.*—Complaints of frequency and nocturia. Bagginess under the eyes suggested nephritis. Urine loaded with albumin with microscopica casts but no pus cells.



*Fig. 9.*—Polycythaemia rubra vera. The florid plum-coloured complexion is accompanied by similar coloration of the tongue and mucous membranes.

even a little of the future. In them is written the record of age and sex; of occupation and habits; of skill or ineptitude; of hard work or indolence (Cutler). A number of references to the hands in relation to general disease will be found in the pages of this book.

So much for a superficial introduction to an important and fascinating study of the first impression concerning the patient, in which the clinician should strive to acquire proficiency.

### THE PULSE

Details of examination of the pulse are dealt with thoroughly in medical works. A few points of especial surgical importance are noted here.

1. Always regard with a certain amount of suspicion the pulse-reading of a patient *immediately* after he has entered hospital, when he is likely to be excited and nervous.



Fig. 10.—'Lantern jaw' acromegaly.



Fig. 11.—Spade-like hands belonging to patient shown in Fig. 10.

A reading 20 minutes after the patient has been put to bed is more likely to register accurately what we desire to know.

2. Remember that the *normal* pulse-rate varies with age, especially when one is dealing with children. Very little information is obtained from the pulse-rate in young infants. In the first few months of life the pulse-rate normally may increase to 170 beats per minute during periods of crying and activity.

#### THE NORMAL PULSE-READING

<i>Age in years</i>	<i>Pulse-rate per minute</i>
Foetus	140–160
0– 1	135
1– 2	120
3– 4	110
5– 9	90
9–11	85
12–17	80
Adult	72

3. A few perfectly healthy individuals have a much slower pulse-rate (bradycardia\*) than is set out in the standard table.

4. Frequent pulse-readings are of considerable assistance in the diagnosis of internal haemorrhage. By 'frequent' is meant not a 4-hourly chart, but an hourly, or even quarter-hourly, record. This can be tabulated on a separate piece of paper, or it can be charted in red ink above the temperature chart. Usually temperature, pulse, and respirations are recorded graphically (preferably in different colours) so that any change in the patient's condition is apparent instantly.

5. Oft-repeated pulse-readings are of paramount importance in the management of cases of head injury. A gradual slowing of, or a rise in, the rate is of such diagnostic importance in early cases that it is advisable to make a routine practice of recording it every quarter-hour.

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\* *Bradycardia*. Greek, βραδύς = slow.



6. If the pulse cannot be felt, try the other wrist; occasionally an anomaly of the radial artery makes even a full pulse difficult or impossible to feel. Should one be unsuccessful in feeling the pulse at either wrist, try the brachial or carotid arteries. When the pulse is too rapid to be counted (over 150 beats per minute) a stethoscope applied to the precordial area usually will enable the heart-beats to be counted. (See also 'Feeling the Pulses of the Lower Extremities', p. 389.)

### THE TONGUE IN RELATION TO THE PATIENT'S GENERAL CONDITION

Because of its particularly rich blood-supply with a capillary network close to the surface, the colour of the tongue is dark red. Normally it is covered by a slight greyish coating. It has been said that the tongue will tell the clinician many things, not only by what he hears, but by what he sees upon it. First, the very way in which the patient responds to the request 'Put out your tongue' may give some valuable information. There is no mistaking the agility, the extent, and the willingness to display as much of the tongue as possible that comes of long practice before a mirror by a hypochondriacal patient.

Regarding coating on the tongue a myth should be dispelled; evidence collected from large series has proved that there is no relationship between a tongue more heavily coated than usual and constipation (Loudon).

**Excessive Furring** will be found to result from:—

1. *Local Infection* arising from the mouth itself (as in stomatitis), from the nose or throat (as in tonsillitis, colds, and sinusitis), or from the lungs (as in bronchitis and pneumonia).

2. *Dehydration of the Mouth* resulting from general dehydration, from pyrexia, from blocked nose (mouth-breathing), or from tobacco smoking.

**Discoloration of the Tongue** can result from chewing or sucking coloured foodstuffs, etc., the leading examples of which are betel nut (bright red), liquorice and iron-containing medicine (black), black cherries and blackberries (purple), and oral antibiotics.\*



Fig. 12.—Patient pointing to the site of the pain. Case of tennis elbow.

**The Significance of a Dry Tongue.**—In surgical practice it is the relative dryness of its dorsum that makes the tongue a most valuable indicator. In late intestinal obstruction, renal failure, and dehydration from any cause, the tongue is dry, brown, and often encrusted, the dryness being due to diminished secretion of the salivary and lingual glands. However, a similar appearance can be caused by mouth breathing by an ill but not dehydrated patient.

(For examination of the diseased tongue see p. 120.)

### THE LOCATION OF PAIN

Whenever pain is a feature of the case, it is an excellent practice to instruct the patient to *point to*

\* Due to the extermination of the normal flora of the buccal cavity and consequent thriving of yeast-like fungi, especially *Monilia*.

*the site of the pain.* More often than not he will indicate an area vaguely, or commence to rub the part. Ask him to place *one finger* on the spot where the pain is felt most (Fig. 12). In order to ascertain if there is a tender place it is often advisable to go further and to insist upon the patient palpating the area himself; only after the patient has concluded *his* examination do you commence *yours*.

The possibility of pain being *referred* should be to the fore in the clinician's mind. Notable examples are shown in Fig. 13.

### LOCAL TEMPERATURE

A sign of great value in early cases of inflammation\* is increased heat of the affected part. A good method of testing for this, but one that requires a little practice, is to pass the hand rapidly from the non-affected to the affected area, and back again (Fig. 14).

### PITTING ON PRESSURE

In order to confirm a suspicion of oedema, pressure is exerted by the thumb or a finger in the case of a

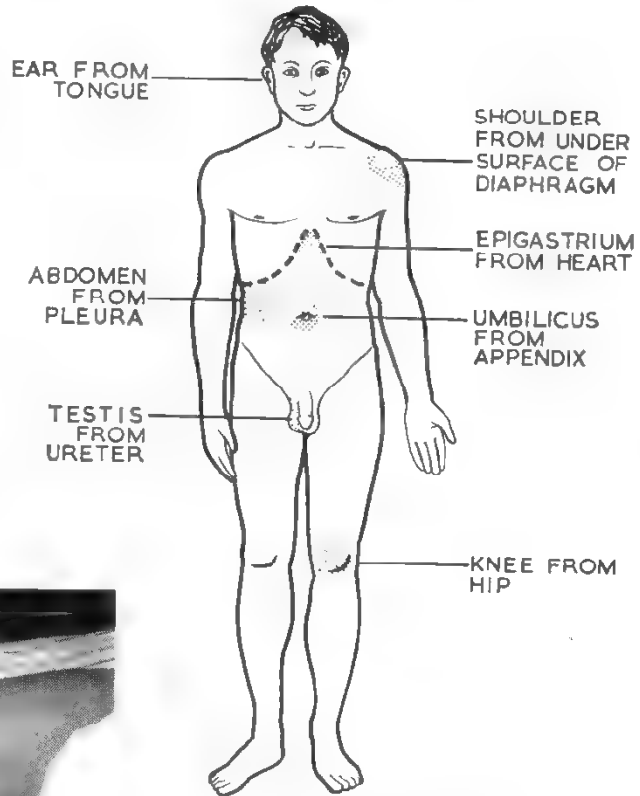


Fig. 13.—Leading examples of referred pain.



Fig. 14.—Testing local temperature in the case of the knee-joint. The hand is passed rapidly from the non-affected side, and back again.

massive infiltration (e.g., of the legs) (Fig. 15). With a comparatively circumscribed swelling the index finger should always be employed. Pressure is maintained for 10–15 seconds. Should the sign be positive, a pit will be produced and will remain where the pressure was exerted (Figs. 16, 17) for upwards of half a minute. When the area is tender (e.g., inflammatory oedema) the index finger is employed and increasing pressure is exerted very slowly. Should a visible depression be doubtful, the palmar surfaces of the fingers are passed over the area, for minor degrees of pitting are sometimes better felt than seen.

'Oedema gives rise to a soft pitting, while if pus be present, induration can always be felt. If this fact is borne in mind, many embarrassing mistakes will be avoided' (Kanavel).

\* This, and other signs of inflammation, later tend to be masked by antibiotic therapy. As a result cold abscesses, formerly almost always tuberculous, are now frequently encountered following non-tuberculous infections.

Oedema of subcutaneous tissues can be due to a number of causes, leading examples of which are outpouring of lymph into the tissue spaces associated with inflammation, blocking of lymphatic vessels by carcinoma cells or by filarial



Fig. 15.—Pitting on pressure. Case of oedema due to a failing heart. Pressure being exerted by the thumb.

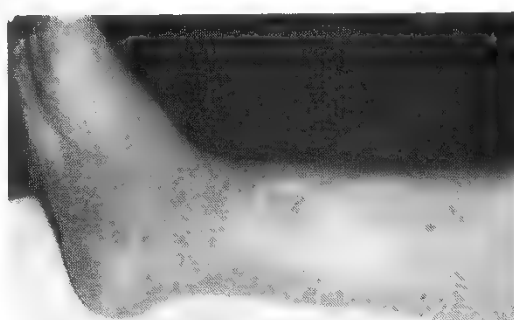


Fig. 16.—A deep pit remains after removing the thumb. Same case as Fig. 15.



Fig. 17.—Pit on pressure on the back of an oedematous hand. Case of thrombosis of axillary vein.

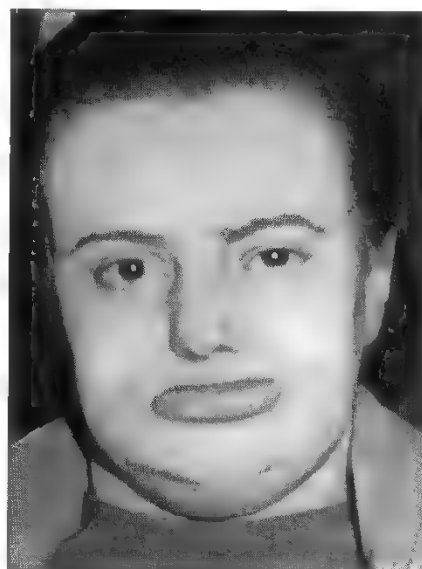


Fig. 18.—Angioneurotic oedema of the lower lip.

nematodes, a defective peripheral circulation (e.g., a failing heart), nephritis, an overdose of intravenous fluid, extravasation of urine, and vitamin B<sub>1</sub> deficiency (e.g., that associated with beri-beri: it also occurs following starvation resulting from a duodenal fistula). Perhaps the most astonishing form is *angioneurotic oedema* (Fig. 18), due to allergy. Swelling of the affected part can take place before one's very eyes, and abate with such rapidity that it has gone, or almost gone, before the students can be summoned from a nearby refectory to observe it.

*Oedema of the Ankle or Ankles*, see p. 548.

*Local Oedema* confined to a limb, usually to a lower limb, can be due to phlebotrombosis, compression of large veins by a tumour, enlarged lymph nodes, or scar tissue. When the cause is obscure, always perform a rectal examination to exclude a carcinoma of the rectum, or other pelvic tumour. In residents of a tropical country, or those who have resided in the tropics, when no other cause is apparent, lymphatic obstruction due to filariasis should be suspected. Finally, one must bear in mind Milroy's disease—hereditary oedema of one (Fig. 19) or both lower limbs, sometimes confined to below the knee, less often to the ankles and feet alone. Women are the usual sufferers. (See also p. 408.)

*Oedema due to Endocrine Disorders.*—Myxoedema is sometimes accompanied by slight pitting oedema. Occasionally the oedema is considerable, and is accompanied by effusion into serous cavities, especially the pericardium.

*Pretibial Myxoedema* (Fig. 20) occurs only in persons suffering from, or, much more frequently, those who have suffered from, thyrotoxicosis and who, as a result of treatment, are now otherwise symptom-free apart, sometimes, from persistent exophthalmos (*see* p. 74).



Fig. 19.—Milroy's disease, left leg.

### FLUCTUATION AND TRANSMITTED IMPULSE

Fluctuation is the most elementary, and probably the oldest, physical sign in surgery.

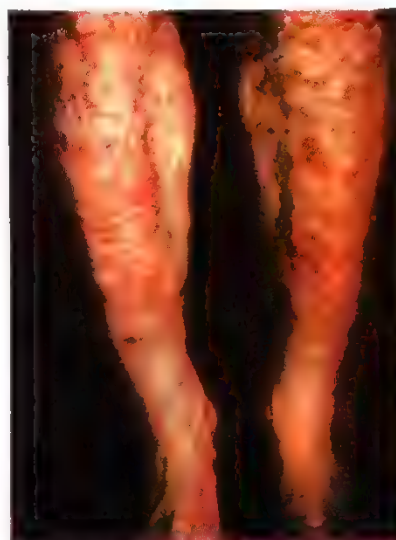


Fig. 20.—Pretibial myxoedema.

Yet how frequently one sees this test attempted in such a manner as to render the result absolutely valueless! The technique was described by Marsh thus:—

'Fingers straight, a little flexed upon the metacarpals; the number of fingers depends upon the size of the swelling—usually the index finger of each hand is sufficient.'

Fluctuation implies transmitted impulse in two planes at right-angles to each other. To illustrate the necessity of this basic principle, the familiar experiment of transmitted fluid impulse across the normal thigh may be undertaken. An impulse through the quadriceps can be elicited in a transverse direction; if, however, the experiment is repeated in the longitudinal axis of the limb, the sign will be absent (Fig. 21).

We will proceed to examine a swelling of moderate size for fluctuation. The pulp of the tip of the right forefinger is placed halfway between the centre and the periphery of the swelling. This is the 'watching finger', and it



Fig. 21.—P, Positive fluid impulse transversely, N, Negative impulse vertically.

is kept motionless throughout the procedure (Fig. 22). The left forefinger is now placed upon a point at an equal distance from the centre, diagonally opposite the first. This is the 'displacing finger'. If the 'watching finger' is displaced by the pressure exerted by the 'displacing finger' in both axes of the swelling, then fluctuation is present, and we know that the swelling in question contains fluid.



Fig. 22.—Standard method of testing for fluctuation. Case of tuberculous abscess connected with the third cervical vertebra.



Fig. 23.—Method of testing for fluctuation suitable for small swellings.



Fig. 24.—Testing for fluctuation in a movable lump. The lump must first be fixed by an assistant. When this has been done, fluctuation can be sought in the usual way.

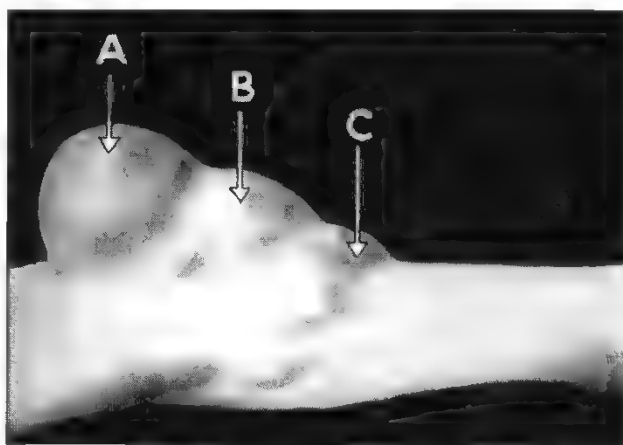


Fig. 25.—Transmitted impulse could be demonstrated from A to B but not from B to C. This proved that the swelling A-B was a distended prepatellar bursa and the swelling C a distended infrapatellar bursa, which, as is well known, has no communication with the former.

A second method of eliciting the sign is suited particularly to small swellings. The technique is illustrated in Fig. 23. The two fingers of the left hand are the 'watching fingers' and should be kept motionless. This also must be tried in two planes at right-angles to one another before the sign is pronounced positive.

When a swelling is mobile in a soft surrounding medium (e.g., a cyst of the breast), it is necessary, before testing for fluctuation, to have the lump 'fixed' by an assistant or other onlooker (Fig. 24).

Examples of *transmitted fluid impulse* are shown in Figs. 25 and 26.



**Fallacies of Fluctuation.—**

1. *Does a lipoma fluctuate?* This is a vexed question, and one that puzzles the student considerably. It can be stated emphatically that many lipomata *do* fluctuate. Fluctuation spells fluid; fat *is* fluid at body temperature.

2. *In swellings of less than 2 cm. in diameter the sign of fluctuation is unreliable.*

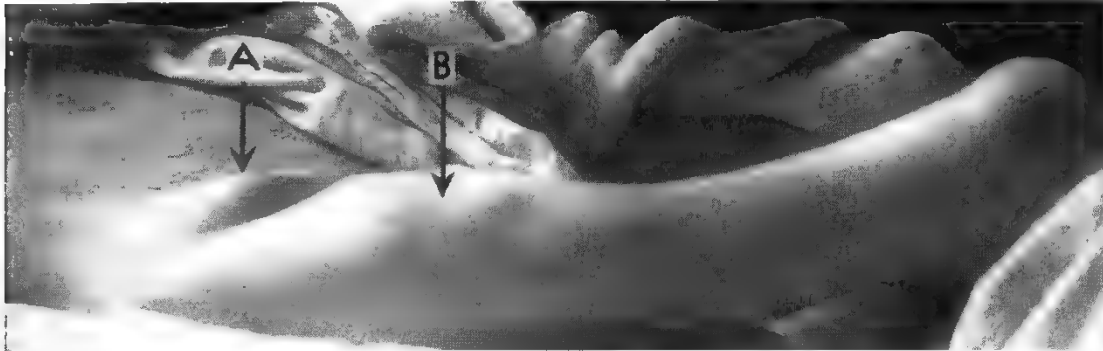
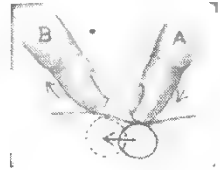


Fig. 26.—Transmitted impulse could be demonstrated from above to below the inguinal ligament (A-B) in this case of psoas abscess.

The reason for this is that in eliciting fluctuation the displacing finger (A), instead of merely increasing tension within a cystic swelling, displaces the swelling (irrespective of whether it is cystic or solid) and so imparts movement to the watching finger (B), viz.

**BALLOTTEMENT\***

This sign, used for the confirmation of pregnancy (of more than 3 months' standing), has several non-obstetric applications:—

*Renal Ballottement.*—In the case of an intra-abdominal swelling suspected of being an enlarged kidney, with the patient supine, one hand is laid flat upon the abdomen, so that the greater part of the flexor surfaces of the fingers



Fig. 27.—Swelling produced by a large right-sided hydronephrosis.

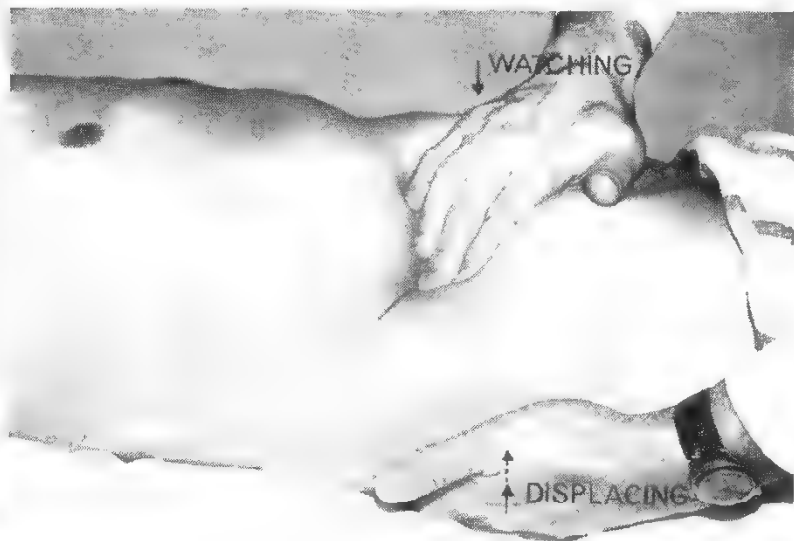


Fig. 28.—Showing the method of eliciting ballottement.

\* French, *ballottement* = a tossing about.

overlies the swelling, while the pulps of the slightly flexed fingers of the other hand are insinuated behind the loin so that they contact the area lateral to the sacrospinalis muscle. Short, quick, forward thrusts are made by the fingers of the posterior (displacing) hand, and if these movements impart a bouncing sensation (due to impacts of the swelling against the anterior abdominal wall) to the anteriorly placed (watching) hand, the sign is positive (*Figs. 27, 28*).

*Ballottement of Intraperitoneal Swellings.*—Sometimes the sign can be elicited in great enlargements of the spleen when the organ is untethered by adhesions. It is not infrequently present with other intraperitoneal swellings, particularly those at least fairly mobile, and especially when they are filled with fluid, e.g., ovarian cysts. However, ballottement is particularly helpful when a mass is present within a peritoneal cavity filled with fluid (ascites)—a circumstance in which difficulty is experienced in stating whether or not an intraperitoneal swelling is present.

*Ballottement of a Swelling rising out of the Pelvis.*—The left (watching) hand is laid over the hypogastrium, while the displacing finger of the right hand is inserted into the vagina, in contact with the cervix uteri if it is the uterus that is suspected of giving rise to the swelling. In *virgo intacta*, and in males with a large swelling occupying the true pelvis, it can be attempted by the displacing finger in the rectum.

### TRANSLUCENCY

The routine application of this very useful sign often sheds light upon the nature of a swelling. There is one trap which must be borne in mind constantly, and that is 'normal skin illumination' (*Fig. 29*). Unfortunately, it is not possible always to work with a torch of exactly the same power. Therefore always make a point of



*Fig. 29.*—Normal skin illumination.



*Fig. 30.*—A cystic hygroma, the only brilliantly translucent swelling of the neck, also occurs on rare occasions in the axilla and the groin.

trying out the 'normal skin illumination' for the torch. If this precaution is neglected, this sign becomes unreliable. In a strong light, especially in the summer sunlight, it should be elicited in the shade of a screen. In doubtful cases the room must be darkened, or, if possible, the patient taken to a dark room.

Brilliantly translucent swellings are a vaginal hydrocele, an encysted hydrocele of the cord, a cyst of the canal of Nuck (*see Fig. 445*, p. 267), a cystic hygroma (*Fig. 30*), and a spinal meningocele. Two fallacies of transillumination are:—

1. In a baby or a young child an inguinal hernia containing small intestine is brilliantly translucent.

2. A vaginal hydrocele of many years' standing (owing to the deposition of fibrin and often blood-pigment on its walls) is usually opaque.

### CREPITUS

There are several varieties of crepitus, each being a sign of fundamental diagnostic importance.




**Bone Crepitus.**—An attempt to elicit this sign of a fracture should be made only rarely when facilities for X-ray examination are not available. Great circumspection and gentleness are required. On movement of the part, coarse grating is so characteristic as to make the diagnosis of a fracture unmistakable. The crepitus of a separated epiphysis is similar, but softer.

**Joint Crepitus.**—The joint is moved with one hand while the other hand is laid upon the joint (*Fig. 31*).



*Fig. 31.*—Method of examining the knee-joint for crepitus.

When present, joint crepitations are unmistakable. They comprise:—

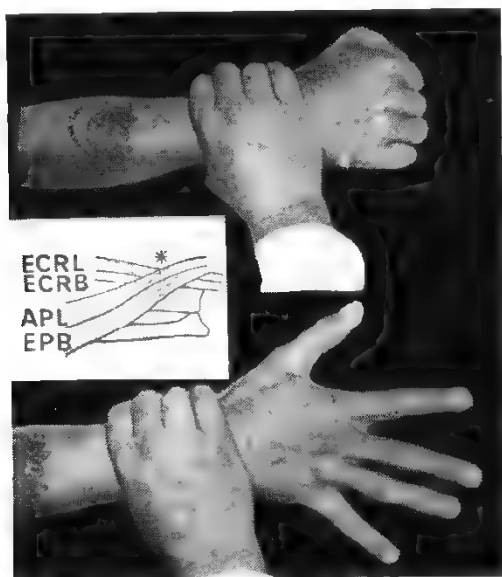
1. Fine, evenly spaced, crepitations, which are present in many sub-acute and chronic joint affections —————→ 
2. Coarse, irregular, crepitations, which usually signify osteo-arthrosis —————→ 
3. A 'click' that can be re-elicited often proves a significant sign of a displaced cartilage or a loose body —————→ 

**Crepitus of Tenosynovitis** is found over an inflamed tendon-sheath when the inflammation is mild and allows of movement. An excellent example is de Quervain's disease (*see p. 474*). The hand is laid upon the arm above the wrist, and the patient



is instructed to open and close his hand (*Fig. 32*). At the point where the extensor pollicis brevis and abductor pollicis longus cross the extensores carpi radialis longus *et* brevis (*Fig. 32*, inset) crepitus may be felt in cases of obscure pain near the wrist.

**Crepitus of Subcutaneous\* Emphysema.**—From a clinical standpoint subcutaneous emphysema, a condition in which gas is present in the subcutaneous tissues, can be divided into four varieties. In all of them a peculiar crackling sensation is imparted to the examining fingers. When one places the fingers fanwise on the affected area and exerts light pressure, a sensation similar to that of



*Fig. 32.*—Testing for crepitus in suspected de Quervain's disease. The site of tenosynovitis is depicted below the asterisk of the inset.

ECRL—Extensor carpi radialis longus. ECRB—Extensor carpi radialis brevis. APL—Abductor pollicis longus. EPB—Extensor pollicis brevis.



*Fig. 33.*—Subcutaneous emphysema following multiple rib fractures.

likewise palpating a horsehair mattress is experienced (Dooley). A stethoscope exerting steady pressure over the suspected area will enable crackling to be heard even though the crepitus is indefinite.

1. **Traumatic** (*Fig. 33*).—Is seen most commonly as a complication of a fractured rib which penetrates the lung, and air extravasates into the subcutaneous tissues (*see p. 186*). Emphysema may extend widely, sometimes from the angle of the jaw to the scrotum. It is important to inquire where the swelling commenced. If it began on one side of the face it is possible that there is a fracture of some part of the wall of the corresponding nasal fossa, and air has been forced into the subcutaneous tissues by the patient blowing his nose. In such circumstances there is no need to presume that a chest lesion is the cause. Other sources of traumatic air extravasation into the subcutaneous tissues are a breach of continuity of the larynx (sometimes due to an accident, but usually due to tracheostomy) and a fractured skull implicating an air sinus such as a frontal sinus (*see p. 60*).

2. **Infective.**—Crepitus similar to the above is found in gas gangrene, but the patient always exhibits other signs of that condition (*see p. 398*).

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\* The older term 'surgical emphysema' is still in use.

3. *Extraneous*.—Subcutaneous effusions of blood are wont to produce crepitus. Typical crepitus is sometimes found after fluid has been administered by the subcutaneous route, but a more common source of perplexity to the uninitiated is when air becomes imprisoned during the closure of an operation wound or as a result of trauma to a limb. The house-surgeon may elicit subcutaneous crepitus and think that gas gangrene has developed in the wound which, except for crepitus, shows nothing amiss and the patient's condition gives rise to no anxiety.

4. *Subcutaneous Emphysema complicating Rupture of the Oesophagus* (see p. 200).

### OBSERVING NORMAL AND ABNORMAL SUPERFICIAL VEINS

To assess the venous pressure, and thereby reap a harvest of highly important clinical data, it is only necessary to retract the garment that hides the root of the patient's neck (Fig. 34).

收回衣物 颈部



Fig. 34.—Retracting the night attire in order to display the external jugular vein should become a clinical habit. In patients who are undergoing continuous intravenous therapy the external jugular vein should be kept uncovered for all to see.

**The External Jugular Vein.**—When the venous pressure is within normal limits, with the head resting upon a pillow, the external jugular vein is either invisible, or visible only for a short distance above the clavicle (Lewis). If the venous pressure is raised, as in myocardial failure, the external jugular vein will indicate it. From a surgical point of view, by far the most important cause of this phenomenon is over-hydration; engorgement of the external jugular vein is the earliest and best clinical sign that a patient is receiving too much fluid intravenously.

Bilateral enlargement of the external jugular vein is seen in singers, due to continued endeavour to reach the top note. If the enlargement is unilateral it may be due to the vein being partially occluded in the supraclavicular fossa by enlarged lymph-nodes, a neoplasm, or a subclavian aneurysm.

**Enlarged Veins over the Superior Thoracic Aperture** are sometimes the key to the diagnosis of a retrosternal goitre (see p. 159) and also of obstruction to the superior vena cava (see p. 195).

**Unilateral Enlargement of Veins over the Upper Part of the Thorax** usually is due to pressure on the subclavian vein.

**A Series of Superficial Venules over the Costal Margin** (Fig. 35, A) is often seen. They are without any clinical significance.

**The Caput Medusae** (Fig. 35, B).—Radiating veins issuing from the umbilicus can be taken as positive evidence of obstruction to the portal venous system. Often the caput is incomplete, only enlarged epigastric veins being seen.

**Inguino-axillary Veins** (Figs. 35, C, 36).—Obvious superficial communication between the veins of the axilla and those of the femoral triangle on both sides

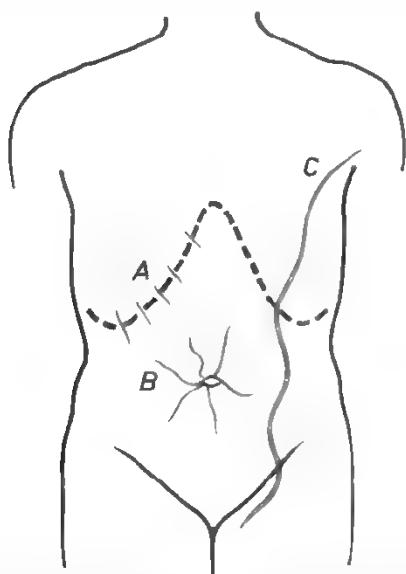


Fig. 35.—A symposium of enlarged superficial veins of the trunk. A, Superficial venules over the costal margin; B, Caput Medusae; C, Inguino-axillary.



Fig. 36.—Enlargement of the superficial epigastric and inguino-axillary veins due to obstruction of the inferior vena cava.

(Fig. 36) is evidence that the inferior vena cava is obstructed. When one side is affected, it signifies blockage of the common or external iliac vein of that side.

For **Varicose Veins** see p. 404.

### HICCUP

Hiccup, which is caused by spasmodic contractions of the diaphragm, is sometimes of considerable surgical significance. Occurring in the course of peritonitis, repeated hiccup often indicates that the diaphragmatic peritoneum has become implicated by upward extension of the inflammatory process. Hiccup is a fairly regular accompaniment of advanced renal insufficiency—even one diaphragmatic explosive contracture may give a lead. On hearing the characteristic sound ask the patient to protrude his tongue. If it looks less moist than normal it is likely that investigation will show that the urinary output is inadequate and the level of the blood-urea is high.

As a rule, hiccup occurring in the early postoperative period signifies pressure on the under-surface of the diaphragm by a dilated stomach or coils of small intestine resulting from paralytic ileus or possibly high intestinal obstruction. At this time, so ominous is the sound of hiccup—perchance one muffled hiccup—that this should be a signal to pass a gastric aspiration tube and empty the stomach forthwith.

### VOMIT

It is possible to recognize only:—

1. The vomit of ingested material which has not had time to be altered by the digestive processes. Such vomit is acid in reaction.
2. Vomit containing blood: (a) Containing a varying percentage of recently

**MEDUSA**, one of the three Gorgons whose fine hair was turned into snakes (Greek mythology).

shed red blood; (b) Containing blood-clot; (c) Containing altered blood and blood-clot.

3. Vomit containing gastric juice when the patient has not eaten recently, i.e., a clear watery fluid, also acid in reaction.

4. Vomit containing bile, i.e., yellow in colour.

5. Vomit containing upper small bowel contents, i.e., green in colour.

6. 'Faeculent' vomit, i.e., lower small bowel contents, brown and smelly.

7. Vomit containing faeces.

8. A peculiar vomit associated with acute dilatation of the stomach (*see* p. 320).

The value of inspecting the vomitus should not be underestimated, but it is necessary to emphasize that it is asking too much to expect to formulate a diagnosis by its aid alone. Other data must be taken into account.

Sometimes there is a doubt whether the specimen contains blood or dark bile. Dilute it with water. If it is bile a green tinge will become apparent.

Vomit containing disintegrated old blood-clot has aptly been called 'coffee-grounds' vomit. Unfortunately the term is much abused, and it is not uncommon to find every dark vomit reported as 'coffee-grounds'. It should be borne in mind that red wine or medicine containing iron may give rise to a 'coffee-grounds' appearance of the vomit.

Faeculent vomiting is found in late intestinal obstruction. It is distinguished not so much by its appearance as by its odour. Vomited tea may *look* like it.

Vomit containing formed faeces is rare, and signifies that there is a communication between the colon and the stomach, unless the patient is a coprophagist.\*

The witnessing of the act of vomiting is of some value in obtaining data upon which to base a diagnosis; for instance, it may be noted that the vomitus is ejected forcibly, as in the projectile vomiting of infantile pyloric stenosis, or that it is effortless and comes up in mouthfuls, as in established peritonitis.

Valuable information regarding the progress of a case of intestinal obstruction may be obtained by the passage of a gastric aspiration tube, and aspiration of the stomach contents from time to time. If untreated, as the obstruction proceeds the character of the aspirations will change from clear gastric juice to greenish bile-stained fluid, and then to typical faeculent material. In the event of spontaneous relief of the obstruction, e.g., in paralytic ileus, this sequence will be reversed.

## FAECES

Inspection of the faeces often provides an important clue to the diagnosis.

## CHARACTERISTIC STOOLS

Typical stools of surgical importance are shown in *Figs. 37-41*.

**The Stools in Very Early Life.**—*Meconium*† is the scanty, semi-liquid, sticky, greenish-black, odourless excreta passed by the neonate during the first two or three days after birth. It gradually gives place to slightly sour-smelling faeces, which by the end of the first week are a thin golden-yellow paste in a breast-fed baby, but paler and putty-like in a bottle-fed baby. As the infant grows older and takes more

\* *Coprophagist*. Greek, κόπρος = dung.

† *Meconium*. Greek, μήκων = a poppy. The physicians of Ancient Greece believed that meconium was the substance responsible for keeping the foetus asleep in utero.



solid food so the stools become less frequent, less smelly, darker, and better formed.

**Blood in the Stools:—**

*Melaena*.★—Blood arising from haemorrhage high in the alimentary canal, e.g., from a duodenal ulcer, is partly digested before it is passed. Usually it is



Fig. 37.—China clay-coloured stool. Complete obstruction of the common bile-duct by carcinoma of the pancreas.

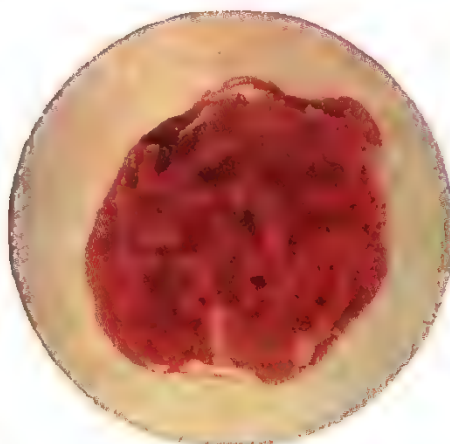


Fig. 38.—Blood-stained mucus passed per rectum by a patient with amoebic dysentery.



Fig. 39.—'Red-currant jelly' stool of intussusception.

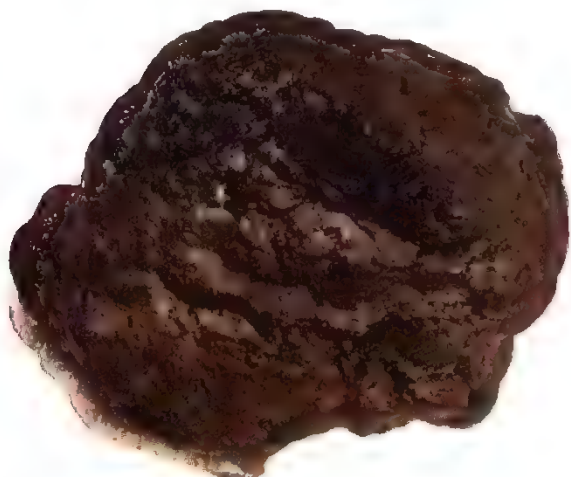


Fig. 40.—Melaena stool. Bleeding duodenal ulcer.



Fig. 41.—Ulcerative colitis. Note the blood-stained mucus clinging to the bed-pan.

★ *Melaena*. Greek, μέλαινα, fem. of μέλας — black.

evacuated by frequent actions of the bowels as black, tarry (sticky) stools (*Fig. 40*). The black stools passed by patients taking iron, bismuth, or charcoal are well formed, small, and not sticky.

*Stools with Varying Tints of Dark Red Fragmented Clots* suggest that the bleeding is coming from the small intestine, e.g., peptic ulcer within, or in the vicinity of, a Meckel's diverticulum, but this assumption is unreliable, for massive gastroduodenal haemorrhage passing rapidly through the intestinal tract frequently results in red, as opposed to melaena, stools.

*Bleeding from the Large Intestine* gives rise to dark red jelly-like material streakily intermingled with the motion.

*Blood arising from the Rectum or in the Anal Canal* is characteristically bright red, and is either passed separately or as an incomplete coating on the surface of the faeces. One streak of bright red blood on the motion should alert the clinician to the possible presence of a fissure-in-ano or internal haemorrhoids or a more serious lesion.

**Steatorrhoea.**—A severe degree of pancreatic insufficiency causes diarrhoea, characterized by malodorous and voluminous stools which float on the water in the lavatory pan. The existence of pancreatic insufficiency is practically certain if the patient passes quantities of fat or oil that separates from the non-fatty portion of the faecal matter; such fat resembles butter that has melted and then becomes solid again (Bright).

**Pipe-stem Stool.**—Totally unreliable is the pipe-stem stool supposed to occur in stenosis, particularly carcinomatous stricture of the rectum.

**Toothpaste Stool** of Hirschsprung's disease (*see* p. 248) is an unusual finding. The faeces are expressed as toothpaste is from a tube; spurious diarrhoea or absolute constipation are much commoner.

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## THE URINE

The macroscopic examination of the urine is considered on p. 344.

## CHAPTER III

## LOCALIZED SWELLINGS

**Deformity.**—Medical students often have difficulty in defining this term. The dictionary definition is 'that which mars or spoils the beauty of a thing' or 'marked deviation from the normal in size or shape of the body or of a part'. Thus a fair majority of surgical diseases, including all those discussed in this chapter, exhibit deformity as do such common conditions as external herniae. Generally speaking, however, the term is reserved to describe an abnormality of bone or joint, notably in disorders of a limb or of the spine. If a bone is out of its anatomical alignment it is deformed; if a joint cannot be placed in its neutral anatomical position it is deformed. 'Fixed deformity' denotes the angle between the neutral position of the normal joint and the position the deformed joint will reach (see Thomas's test, p. 501).

**The Diagnosis of a Lump.**—

**Step 1.**—The first essential procedure is to leave no stone unturned in the endeavour to make certain in what *anatomical plane* the lump is situated. Ask yourself, 'Is it in the skin (Figs. 42 and 54), subcutaneous tissue (Fig. 94), muscle (Fig. 56), tendon, nerve (Fig. 51), or bone (Fig. 49); or is it attached to some particular organ?' [inadev]

**Step 2.**—Determine the physical characteristics of the lump. Is it tender or non-tender? If not acutely tender determine its:—

**Size:** Express as a measurement preferably in metric units.\* Comparison with common objects is to be deprecated; even hen's eggs vary in size.

**Shape:** Round or flattened; regular or irregular.

**Consistency:** Five convenient gradations of consistency that have proved tolerably satisfactory are: very soft (like jelly), soft (as relaxed muscle), firm (like a contracted muscle), hard (as a contracted biceps of a boxer), and stony or bone hard.

**Step 3.**—Having completed the examination, if the diagnosis is still uncertain run through the following little catechism to yourself: —

1. Is the lump congenital? If not—
2. Is it traumatic?
3. Is it inflammatory? If so, is it acute or chronic?
4. Is it neoplastic? If so, is it benign or malignant? If malignant, is it primary or secondary?
5. If it is none of these, a degenerative, a metabolic, a parasitic, or a hormonal disorder may provide the key.

Of the multitudinous variety of lumps that are presented for diagnosis, the simplest is a *sebaceous cyst*. Manifestly the swelling is *in* the skin, but because the swelling is often comparatively small and the contents are pultaceous† it is not

\* In scientific medicine the results of all tests are expressed in metric quantities as are dosages of drugs and fluid balance charts. It is illogical, therefore, to measure size in inches.

† *Pultaceous*. Latin, *pulse* — porridge.

always possible to be certain whether it is cystic. Elementary as is the diagnosis, when a sebaceous cyst occurs in an unusual situation it is surprising how often the lump is misdiagnosed. Occasionally an obvious punctum (Fig. 42) settles the diagnosis without any further ado.

Next in simplicity of diagnosis, and even commoner, is a subcutaneous lipoma.

A lipoma superficial to the deep fascia (the usual situation) is an elementary clinical problem, because often its lobulation can be made out, especially if the swelling can be compressed between the finger and thumb of one hand while its surface, now more prominent, is stroked firmly by the fingers of the other hand. Another sign of value is the 'slipping' sign. If the edge of the lump is pressed, the swelling slips from beneath the finger (Fig. 43). In the case of a subcutaneous lipoma, so regularly can this sign be elicited that it may be said to be pathognomonic\* of that condition. On the other hand, a lipoma situated beneath the fascia (Fig. 44), or especially beneath muscle, is often exceedingly difficult to diagnose, because fluctuation cannot be elicited and the overlying fascia negates the slipping sign and masks the lobulation. An easily recognized variety which is not uncommon is the pedunculated lipoma (Fig. 45).

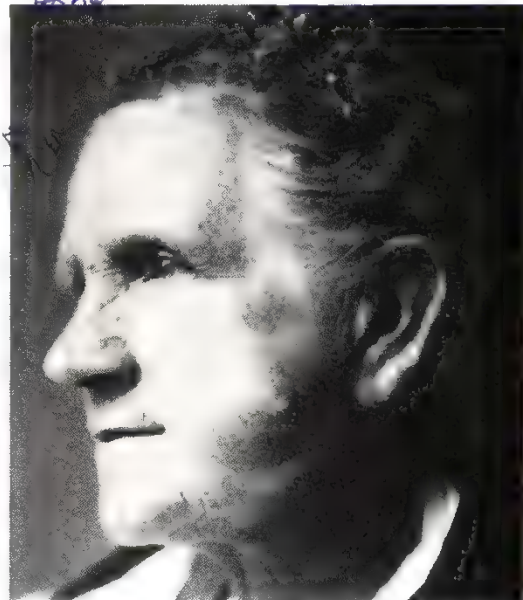


Fig. 42.—Owing to its large size, it is impossible to verify that the cystic swelling arises in the skin, but the obvious punctum leaves no doubt concerning the diagnosis—sebaceous cyst.

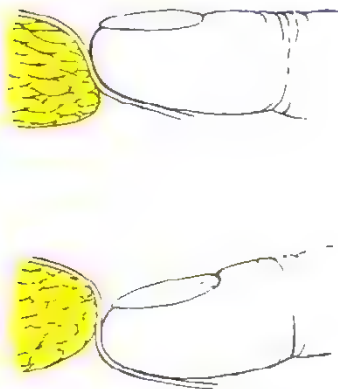


Fig. 43.—The slipping sign of a subcutaneous lipoma.



Fig. 44.—Lipoma situated beneath the deep fascia in front of the elbow.

As a rule, a lipoma is entirely painless; from time to time subcutaneous lipomata are multiple (Fig. 46), and if one or more of them is painful, or at least tender, the condition is known as *adiposis dolorosa* or *Dercum's disease*. Other multiple

\* *Pathognomonic*. Greek, *πάθος* — disease + *γνώμος* = signature. The signature of that disease, and none other.



superficial lumps comprise neurofibromatosis (*see Fig. 63, p. 29*), warts and naevi, and secondary carcinomatous nodules.

A *malignant melanoma* (*Fig. 47*) can arise in any pigmented tissue such as the anal skin or the uveal tract, but it does so most frequently in a pigmented skin mole. Unless removed very early, this tumour is of relentless malignancy (*see Fig. 445, p. 240*).



*Fig. 45.*—Pedunculated lipoma on the back.

Throughout the demonstrations that follow, reference will be made to the diagnosis of lumps in various regions and particular organs, but before leaving this important subject it is necessary to demonstrate some physical signs of general application.

**The Sign of Emptying.**—When the swelling is compressed it diminishes in size considerably or disappears; when the pressure is released, it refills slowly (*Fig. 48*). This is *the* sign of a cavernous haemangioma (*Fig. 50*), but it is also present in lymphangiomata, and meningoceles, with narrow necks.



*Fig. 46.*—Multiple subcutaneous lipomata (Dercum's disease).



*Fig. 47.*—Malignant melanoma of the sole of the foot.



*Fig. 48.*—The sign of emptying.

## SOME LUMPS FOR DIAGNOSIS



Fig. 49.—The swelling appeared in a matter of weeks and is not tender or warm to the touch. It would be correct to make a diagnosis of 'probably secondary malignant disease of bone', but where is the primary? In this instance biopsy proved a bone metastasis secondary to carcinoma of the thyroid.

Fig. 49



Fig. 50.—Cavernous haemangioma extending into the orbit. The swelling gave the sign of emptying.



Fig. 51.—The swelling can be moved freely from side to side, but not upwards or downwards. When it is pressed, the patient experiences sharp pain shooting into the hand. Tumour of the ulnar nerve.

Fig. 51

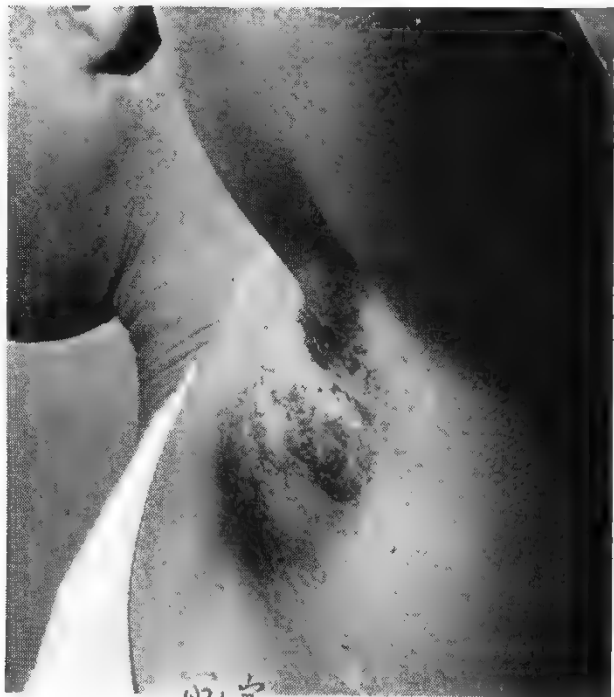


Fig. 52.—Axillary swelling. On palpation it shows expansile pulsation. Systolic bruit present. Aneurysm of axillary artery following trauma.

## SOME LUMPS FOR DIAGNOSIS



Fig. 53.—Capillary angioma (strawberry naevus).



Fig. 54.—Pedunculated papilloma. Slowly increasing in size for 15 years, it finally outgrew its vascular supply and it has become gangrenous.



Fig. 55.—Students who examined this patient concluded that the swelling was an abscess, but it is not tender, the periphery feels 'wooden' and lacks superficial oedema. It is doubtful whether the sign of local heat is present. Case of fibrosarcoma springing from the sacrospinalis.



Fig. 56.—Not attached to the skin, the lump can be moved freely on the humerus. When the biceps muscle contracts the lump moves with the muscle. With the biceps contracted the mobility of the tumour decreases. Diagnosis: Fibrosarcoma of the biceps muscle.

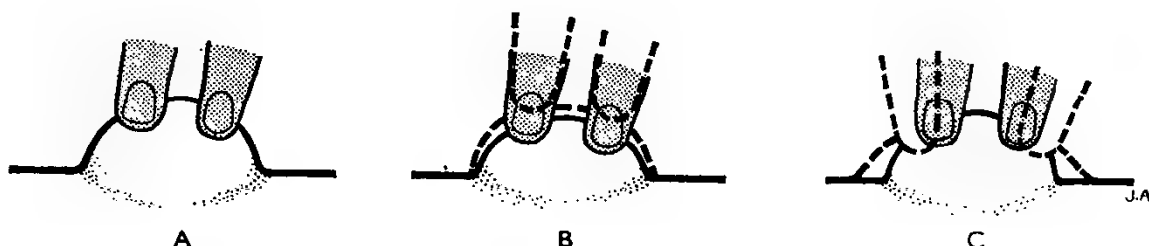


Fig. 57.—The patient had noticed a lump in the groin for many years. For ten days it had been painful and for three days she had vomited incessantly. Strangulated femoral hernia with gangrene of contents (small bowel) and of overlying skin. This case presented, not in a remote area lacking in doctors, but in England in 1966!

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On a miniature scale, the sign of emptying is useful in the diagnosis of a capillary angioma (*Fig. 53*), which blanches when the skin about it is put on the stretch. In this way tiny capillary angiomas can be distinguished from de Morgan's spots. The latter are raspberry red (*see Fig. 476*, p. 256), and do not show the sign of emptying. They are of no clinical significance. At one time they were thought to suggest visceral carcinoma.

**The Sign of Indentation.**—Certain cysts (large dermoid and sebaceous cysts) containing pultaceous material can be moulded. When the swelling is indented with the finger, in contradistinction to the sign of emptying, it stays indented. The only other lump in which indentation occurs is one formed of solid faeces.



*Fig. 58.*—A, Place the index and middle fingers on the swelling. B, Transmitted pulsation. C, Expansile impulse. The sign of an aneurysm.

**Expansile Impulse.**—It is often a perplexing problem to decide whether the pulsation of a swelling is *transmitted* from a neighbouring artery or whether the swelling itself is pulsating (*Fig. 52*). Place the index and middle fingers over the swelling (*Fig. 58*). They will be felt to move with the swelling. If the pulsation is transmitted, the movements of the fingers during each throb of the pulse are parallel with each other. If the swelling is expansile, the fingers are felt to move apart.

**Estimating the Size of an Aneurysm.**—The following method is helpful in deciding whether surgical treatment is necessary, notably with abdominal aortic aneurysm (Eastcott). Place the parallel index fingers → in the long axis of the aneurysm at its outer margins. The distance between the finger tips equals the diameter of the aneurysm.



When a stethoscope is applied over it, an aneurysm is either silent or a systolic bruit can be heard. On the other hand, an arteriovenous fistula emits a continuous murmur through systole and diastole (Rob).

It should always be remembered that a very rapidly growing vascular neoplasm, particularly a bone sarcoma, often pulsates very obviously. 'A swelling which has most of the characteristics of, but is not, an aneurysm, is a sarcoma' (Morison).

**Tumour of a Muscle** (*Figs. 55, 56*), or any swelling situated in, or attached to, a muscle, gives one pathognomonic sign. When the muscle is relaxed the lump is movable freely across the long axis of the muscle; when the muscle is contracted, this range of movement becomes abruptly limited. Sometimes the patient understands what is meant by a request to brace the muscle, or group of muscles, to which the muscle in question belongs. More often the muscle must be rendered tense by causing it to contract against resistance. Expedients for rendering individual voluntary muscles tense, or attempting to render them tense if they are suspected of being paralysed, are discussed in Chapter XXVII.

**Herniation of a Muscle** is shown when a lump appears on the patient being asked to tense the muscle.

CAMPBELL DE MORGAN, 1811–1876, *Surgeon, Middlesex Hospital, London.*

HARRY H. G. EASTCOTT, *Contemporary Consultant Surgeon, St. Mary's Hospital, London.*

CHARLES G. ROB, *Contemporary Professor of Surgery, Rochester, New York.*

JAMES R. MORISON, 1853–1939, *Professor of Surgery, University of Durham, Newcastle-upon-Tyne.*



**Fibrosarcoma** can take varying forms in the subcutaneous tissue, fascia, or muscle. It is firm or hard in consistency, grows slowly, and typically, unless widely excised at the first operation, recurs time and again (*Figs. 55, 56*).

**Desmoid Tumour** is an example of the above. It occurs in the abdominal wall, often in the lower half and usually in middle-aged multiparous women and occasionally in operation scars.

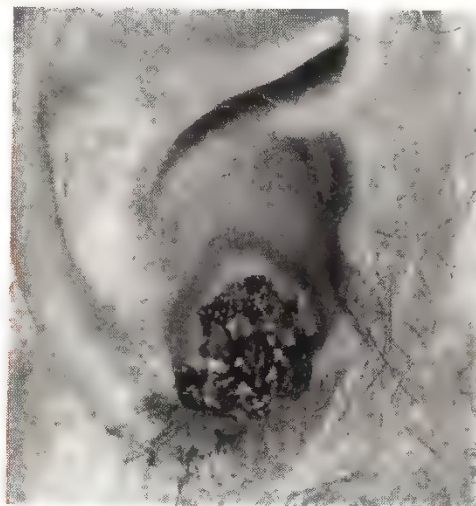
**Tumour of a Nerve.** See *Fig. 51* and p. 423.

**Tumour of Bone** (*Fig. 49*).—The characteristics are discussed on p. 430.

**Cutaneous Swellings** that often give rise to diagnostic difficulty:—



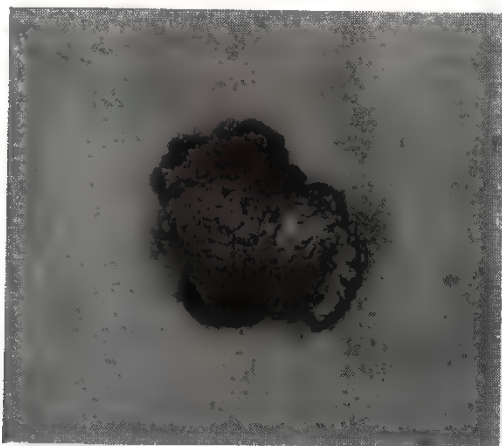
*Fig. 59.*—Molluscum sebaceum of the lip at an early nodular stage.



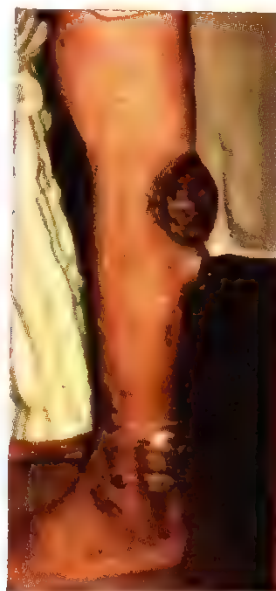
*Fig. 60.*—Molluscum sebaceum of the ear at the stage of ulceration.

**Molluscum\* Sebaceum** (kerato†-acanthoma‡) is a nodule usually on the face (*Fig. 59*), which as a rule is solitary. It varies in size from  $\frac{1}{2}$  cm. up to 3 or 4 cm. in diameter ('giant' variety) and is firm in consistency. It must be distinguished from a wart by its being harder and less hyperkeratotic. Later, during the course of its natural regression without treatment it breaks down and ulcerates, when it is liable to be confused with an epithelioma (*Fig. 60*).

**Keratoma Senilis** (senile hyperkeratosis) is found usually on the face or dorsum of the hands of elderly persons, especially those who have been exposed to the elements. Often solitary, the lesion is flat or elevated, greyish-brown in colour, and covered by scales (*Fig. 61*). It is an entirely benign lesion.



*Fig. 61.*—Senile hyperkeratosis on the back of the hand of a patient aged 73.



*Fig. 62.*—Kaposi's sarcoma occurring in a Jew born in Poland.

\* *Molluscum*. Latin, *molluscus* = soft.

† *Kerato*. Greek, *κέρας* = horn. A prefix denoting horny tissue or the cornea.

‡ *Acanthoma*. Greek, *ἀκανθα* = prickle + *ωμα* = tumour. Excessive local development of the stratum granulosum of the skin.

**Kaposi's Sarcoma.**—Jews from Poland, Eastern Europeans, and Italians are more susceptible than members of other white races but the condition is relatively common in Africa south of the Sahara Desert. Generally the tumour arises in middle life in males as multiple, symptomless, plum-coloured nodules, usually situated on the lower extremities (*Fig. 62*).

### ON 'SPOT' ('SNAP') DIAGNOSIS

As a rule, lightning diagnoses are to be disparaged: often dramatic, they may prove dangerous. More reliance can be placed upon a conclusion based on data



*Fig. 63.*—When diffuse neurofibromatosis is associated with cutaneous pigmentation and the presence of multiple sessile and pedunculated tumours on the skin, the condition is known as von Recklinghausen's disease of nerve or molluscum fibrosum.



*Fig. 64.*—A sebaceous horn growing from the ear.

gleaned from touch as well as sight (*Fig. 55*). However, there are clinical conditions that should be apparent to the diagnostician almost immediately. Take, for instance, diffuse neurofibromatosis (*Fig. 63*). If a student palpates one nodule,

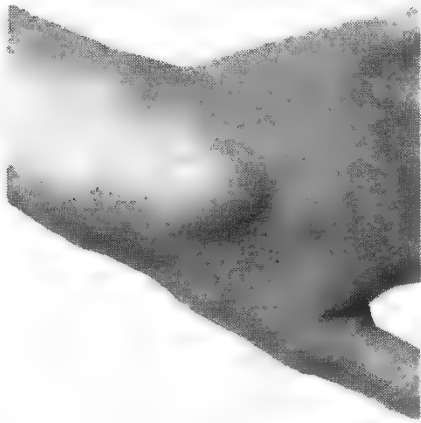


*Fig. 65.*—Onychogryphosis.\*

\* *Onychogryphosis*. Greek, *ὄνυξ* — nail + *γρύπωσις* = curving.



ponders, and then commences examining another of these subcutaneous swellings, it usually transpires that he is not aware of this clinical entity. There are a number of lumps that can be only one thing, and if the clinician is familiar with the condi-



*Fig. 66.*—Simple ganglion of the dorsum of the wrist.



*Fig. 67.*—Ainhum; in no other condition does spontaneous amputation of the little toe occur.

tion, an absolute diagnosis is forthcoming almost immediately. Naturally their number increases with experience. The foundation of 'spot' diagnosis is to have encountered an exactly similar case previously.

*Figs. 64–67* illustrate some clinical entities, which, once seen, can be diagnosed at almost lightning speed.

## CHAPTER IV

## LOCAL INFLAMMATION; ULCERS AND SINUSES; SCARS

## CLASSIC SIGNS OF INFLAMMATION

THAT redness,\* swelling, heat, and tenderness are the cardinal signs of inflammation was first expounded by Celsus: to these four signs can be added that described by Galen—loss of function.

No better demonstration of these signs can be given than in the case of a simple boil. Where a boil ends and a carbuncle (Fig. 68) begins is nebulous, but there is no mistaking a fully developed example of the latter. That the urine must be tested for sugar in cases of carbuncle and multiple boils cannot be repeated



Fig. 68.—Typical early carbuncle.



Fig. 69.—Cutaneous anthrax.

too often. Notwithstanding this injunction, it should be remembered that ketone bodies are sometimes present in the urine of patients with multiple boils, not because the patients are diabetic, but because of the toxaemia. A virulent boil of the face may be mistaken for anthrax. Even in cases where the black central scab and circumscribed surrounding vesicles make the diagnosis of anthrax (Fig. 69) practically certain, confirmation by bacteriological examination of the serum from a vesicle is essential. Pus and pain are absent.

## ERYSIPELAS†

The most common site of origin is the face, including the lobule of the ear—sometimes infected by non-aseptic piercing for ear-rings. The lesion is rosy or crimson, with a peculiar smooth and characteristically shiny appearance.

The affected part is tender and definitely warmer than the adjacent skin. The patient's temperature rises to between 39° and 41° C. When the face is attacked oedema closes the eyelid (Fig. 70) or eyelids completely. Usually the regional

\* In dark-skinned races this sign is replaced by shininess of the skin.

† Greek, ἐρυθρός = red + πέλλα = skin.

lymph-nodes are moderately swollen. The eruption reaches its peak on the fifth day; the brilliant erythema then changes to a livid hue, after which it turns brown and later yellow. In some cases an exudate occurs beneath the cutis to form vesicles



Fig. 70.—Erysipelas of the face.



Fig. 71.—Erysipeloid. The patient was a fishmonger.

that later turn to pustules. Owing to the frequency with which the face is attacked, other sites tend to become forgotten. The hands and genitalia share the next most common sites, then the umbilicus in young infants; finally a decubitus ulcer of the lower limb is sometimes the site of entry of the specific streptococci of erysipelas.

For the differential diagnosis between erysipelas and superficial cellulitis of the face, see p. 33.

#### ERYSIPELOID

Erysipeloid (fish handler's disease) occurs almost exclusively in fish and meat handlers, not forgetting seamen engaged in whaling and sealing. Three or four days after a scratch or cut, the surrounding area becomes inflamed and dark red or purple in colour (Fig. 71). As a rule, some part of the hand is affected. The infection lies in the skin and the subcutaneous tissues, and therefore presents many of the features both of erysipelas and cellulitis, with two notable exceptions—the constitutional symptoms are relatively slight and the infection is self-limiting.

#### CELLULITIS

Inflammation of cellular tissue can be superficial or deep. Superficial (i.e., subcutaneous) cellulitis is the more common and the less difficult to diagnose.

The part affected is swollen, tense, and tender. Later it becomes red, shiny, and boggy. Frequently cellulitis commences in an infected wound. If a wound is not at once apparent, look for a small puncture, blister, or abrasion where organisms could have gained entrance. Examine the regional lymph-nodes for enlargement. After the local examination has been concluded, take the patient's temperature.



In the case of a child, where no obvious abrasion exists in the immediate vicinity, bear in mind Morison's aphorism: 'Cellulitis occurring in children is never primary in the cellular tissues, but secondary to an underlying bone infection.'

From the point of view of differential diagnosis, early superficial cellulitis may be said to have:—

1. *No edge.*
2. *No fluctuation.*
3. *No pus.*
4. *No limit.*

In adults, when a breach of the continuity of the skin has been excluded, the most common site of origin of cellulitis is an infected bursa. The bursa thus implicated can be either an anatomical bursa (notably an olecranon or a prepatellar



Fig. 72.—Subcutaneous cellulitis spreading from an infected prepatellar bursa.



Fig. 73.—Bunion—the colloquial name given to an inflamed bursa over a hallux valgus. In this case the infected bursa had ruptured through the skin.

bursa (Fig. 72)), or an adventitious\* bursa, the leading example of which is a bursa over a hallux valgus, known colloquially as a 'bunion' (Fig. 73).

**Cellulitis of the Face** is sometimes difficult to distinguish from erysipelas. In this connexion, Milian's sign may prove helpful.

**Milian's Ear Sign.**—As facial erysipelas spreads, it involves the pinna because it is a cuticular lymphangitis. On the other hand, all subcutaneous inflammations stop short of the pinna because of close adherence of the skin to the cartilage.

**Cellulitis of the Orbit.**—(See p. 70.)

**Ludwig's Angina†** is cellulitis occurring beneath the deep cervical fascia. In many instances of this condition the floor of the mouth becomes oedematous; in Fig. 74 the tongue can be seen displaced upwards by the swelling and oedema.

**Other Examples of Deep Cellulitis** are: (1) That occurring in layers of the abdominal wall after an operation for a purulent condition, especially when the drainage afforded is inadequate; and (2) Pelvic cellulitis, e.g., parametritis, that occurring in the connective tissue around the uterus.

\* Adventitious = occurring in an unusual place.

† Angina. Latin, *ango* = to throttle.

<sup>[pseudoma]</sup>  
<sup>pye</sup>  
**Pyoderma Gangrenosum** (Meleney's Gangrene or Ulceration, Postoperative Synergic\* Gangrene).—Often on the abdominal or chest wall after an operation for a septic condition, but occasionally elsewhere in which case the patient often suffers from ulcerative colitis, but sometimes without obvious cause, an area of cellulitis appears which progresses rapidly with the



Fig. 74.—Ludwig's angina. The swelling in the submental region, and the inability to close the mouth owing to oedema of the tongue and floor of the mouth, can be seen



Fig. 75.—Pyoderma gangrenosum of the thigh in a 17-year-old pregnant, but otherwise healthy, female.

formation of a central purplish zone surrounded by an angry red zone. The whole area is exquisitely tender with gross oedema of the surrounding skin. Soon the purplish zone becomes gangrenous (Fig. 75), and unchecked the gangrene spreads widely. At first the general signs are mild unless the patient is already debilitated from the underlying disease. When the gangrenous skin sloughs an ulcer with undermined edges is left.



Fig. 76.—Gumma over the manubrium.

<sup>synergic</sup>  
**A Gumma**, although now rare, is a great imitator, and never reaches a large size. At first firm, it is not long before it commences to soften in the centre. Next, the overlying skin becomes infiltrated and reddish-purple. Finally, the characteristic ulcer (see p. 39) forms. A point in favour of the diagnosis of gumma is that it tends to occupy the middle line (Fig. 76).

#### CAT-SCRATCH DISEASE

This infection, due to a cat bite or scratch, is frequently misdiagnosed. It occurs about ten days after inoculation, by which time a minor breach of the skin is liable to have healed, although one should search for a primary lesion, which resembles a furuncle. The leading sign is considerable lymphadenitis without visible intervening lymphangitis, the axillary or inguinal lymph-nodes being affected almost exclusively. The constitu-

\* Synergism. Greek, *συνεργειν* working together. Infection by two interdependent organisms in this instance a *micro-aerophilic streptococcus* and a *haemolytic staphylococcus*.

tional symptoms are often considerable. The diagnosis is supported by finding an enlarged spleen, but it can be confirmed only by the specific intradermal test.

### ACUTE LYMPHANGITIS

Inflamed superficial lymphatic vessels can be seen coursing from the site of infection to the regional lymph-nodes. Such a tell-tale red line or lines may occur in the skin of one of several regions, but is seen principally in an arm or a leg (Fig. 77). Sometimes the initial lesion is so minute that it cannot be found even after a careful search.



Fig. 77.—Acute lymphangitis with subcutaneous cellulitis over the inguinal lymph-nodes which are usually enlarged and tender.

### PHLEBITIS

Phlebitis and thrombosis occurring in *deep* veins have to be recognized by their effects, for there may be no physical signs of the condition itself. Phlebitis of *superficial* veins is easily recognized, and because thrombosis and phlebitis go hand in hand (thrombophlebitis) the veins feel like tender, hard cords. Varicose veins are frequently the seat of phlebitis (Fig. 78).

### ULCERS

When one is examining an ulcer particular attention should be paid to the following points:—

*The Shape.*—Is it round, oval, irregular, or serpiginous?\*

*The Edge.*—This may be sloping downwards towards the crater, undermined, punched out, or everted.

*The Floor.*—The most typical is the slough in a gummatous ulcer, which looks like wet wash-leather (chamois leather).

*The Base.*—Whether indurated or attached to deeper structures.

*The Surrounding Tissues.*—Look for signs of inflammation, pigmentation, or varicosity.

After an ulcer has been examined it is essential to consider next its lymphatic drainage and the nodes connected therewith. Sometimes these are obviously

\* *Serpiginous*, creeping like a serpent. Healing in one place while extending in another.





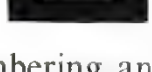




Fig. 78.—Thrombophlebitis occurring in varicose veins.

involved; more often a systematic and painstaking examination by palpation is required.

As is shown in the following diagrams, ulcers are of five main varieties:—

1. A carcinomatous ulcer has everted edges which to the palpating fingers feel hard —————→ 
2. Rodent ulcer has slightly raised edges —————→ 
3. The so-called 'septic ulcer', of which varicose ulcer is the commonest example, has sloping edges —————→ 
4. The tuberculous ulcer is characterized by undermined edges → 
5. An ulcer of tertiary syphilis is punched out —————→ 

Concerning two of the above ulcers, now rare, it is worth remembering an old-time aphorism—syphilis bites; tuberculosis nibbles.

**A Carcinomatous Ulcer** (syn. *epithelioma*, *squamous-cell carcinoma of skin*) can hardly be mistaken, especially after the eversion and the induration of the edge of the ulcer have been observed (Fig. 79). Until fairly recently *molluscum sebaceum* (see Fig. 60, p. 28) was frequently confused with epithelioma.

**Rodent Ulcer\*** (syn. *basal cell carcinoma of skin*).—Particularly if early, the features of malignancy are not nearly so obvious. The fact that a rodent ulcer is commonly situated above a line joining the angle of the mouth with the lobule

\* *Rodent ulcer*, so called because it gnaws the tissues (even bone) like a rat.

of the ear (*Fig. 80*) should put the clinician on his guard. Its outline is circular, its edge, if not everted, is definitely raised, and this heaped-up edge often shows nodules possessing a peculiar pearl-like lustre (*Fig. 80*). Minute venules in the edge of the ulcer are characteristic.



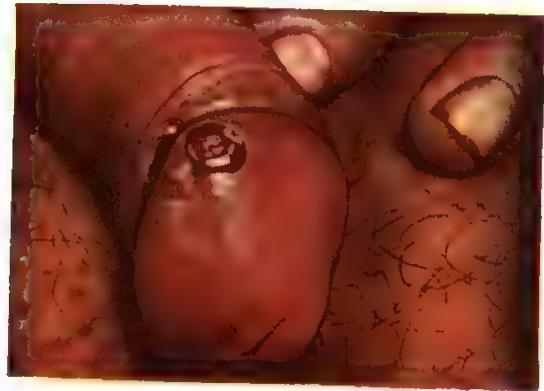
*Fig. 79.*—A large epithelioma with a typical edge.



*Fig. 80.*—A rodent ulcer usually occurs above an imaginary line joining the angle of the mouth and the lobule of the ear.



*Fig. 81.*—The 'apple-jelly' test for lupus. Inset shows 'nodules' which become apparent on pressure. The arrow points to a collar stud abscess with skin involvement connected with breaking down tuberculous parotid lymph-nodes.



*Fig. 82.*—Hunterian chancre.

[S. J. K.] 1. 10

A **Tuberculous Ulcer** nearly always has undermined edges, this characteristic being shared only by some bed-sores. Tuberculous ulcers are usually painful.

When *lupus vulgaris*\* (cutaneous tuberculosis) as a cause of cutaneous ulceration is suspected, take a glass slide (or a glass tongue depressor) and press it firmly over the lesion (Fig. 81). Pressure removes the surrounding hyperaemia, and apple-jelly-like nodules become apparent (Fig. 81, inset).

The **Hunterian Chancre** (primary syphilitic sore) (Fig. 82) is a painless ulcer.



Fig. 83.—Primary chancre of the upper lip with characteristic bilateral enlargement (because of crossed lymphatic drainage) of the submental and submandibular nodes. In this case the nodes are more marked on the side opposite to the lesion.



Fig. 84.—Cutaneous gumma situated over the middle two-fourths of the leg below the knee—a characteristic situation. Compare with varicose ulcer (Fig. 85).



Fig. 85.—Varicose ulcers are apt to appear in pigmented areas, and they tend to 'ride the vein'. They are almost confined to the lower quarter of the leg.

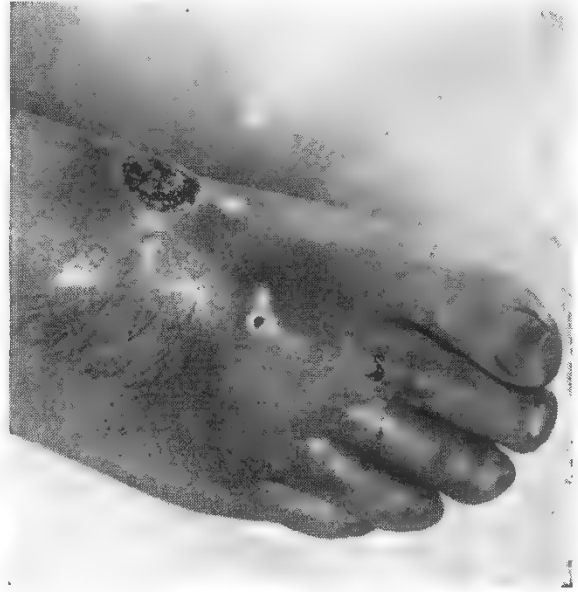


Fig. 86.—Perforating ulcer of the dorsum of the foot occurring in a patient with tabes dorsalis. A smaller, deeper, ulcer is present on the sole of the foot—the typical situation.

\* *Lupus vulgaris*. Latin, *lupus* = a wolf; *vulgaris* = ordinary. 'Lupus is a malignant ulcer . . . and it is very hungry like unto a wolf.' (Philip Barrow, *Method of Physicke*, 1590.)

JOHN HUNTER, 1728–1793, Surgeon, St. George's Hospital, London, was imbued with the idea that syphilis and gonorrhoea were manifestations of the same infection. To test his hypothesis he inoculated himself by means of a scalpel. Twenty-four years later he died of an aortic aneurysm.



It is usually oval, has sloping edges, and exudes a discharge that is often blood-stained. When first inspected it is often covered by a crust, removal of which reveals the base covered with pink granulations. To the palpating fingers (protected by gloves) the ulcer is hard; even when the lesion is palpated through the prepuce the hardness is apparent—it has been likened to the sensation of feeling a buried button.

The lymph-nodes of the groin can be felt slightly enlarged; 'shotty' is the term that has been given to them. By 'shotty' is implied that the nodes are hard and small. This is very different from the extravagant enlargement of the regional lymph-nodes that occurs when a primary syphilitic sore is extragenital (*Fig. 83*).

A **Gummatous Ulcer** is unquestionably punched out and painless. The base of the ulcer is covered with the characteristic wet wash-leather (chamois leather) slough which may contain one or more 'islands' of normal tissue that have escaped the gummatous necrosis. It should be noted that wash-leather sloughs occur also in tissue undergoing post-irradiation necrosis.

A healed gumma gives a circular 'tissue-paper' scar, which is strong evidence of a previous syphilitic infection. The scar of yaws (*see p. 543*) is similar.

The punched-out appearance so characteristic of a gummatous ulcer (*Fig. 84*) is seen sometimes in a gravitational or a varicose ulcer (*Fig. 85*) and often in trophic\* ulcers, particularly perforating ulcer of the foot (*Fig. 86*), which is associated with tabes dorsalis and other diseases of the central nervous system or diabetic neuropathy.

### SINUSES AND FISTULAE

A *fistula* implies a tunnel connecting two epithelial surfaces, whereas a *sinus* is a blind track opening on to the skin or a mucous surface. Several references to fistulae and sinuses in particular situations will be made later in the book.



*Fig. 87.*—Sinus connected with suppurating tuberculous lymph-nodes. In this case the affected nodes are in the upper third of the neck, and the sinus opens in the lower third, thus constituting a 'collar-stud'.



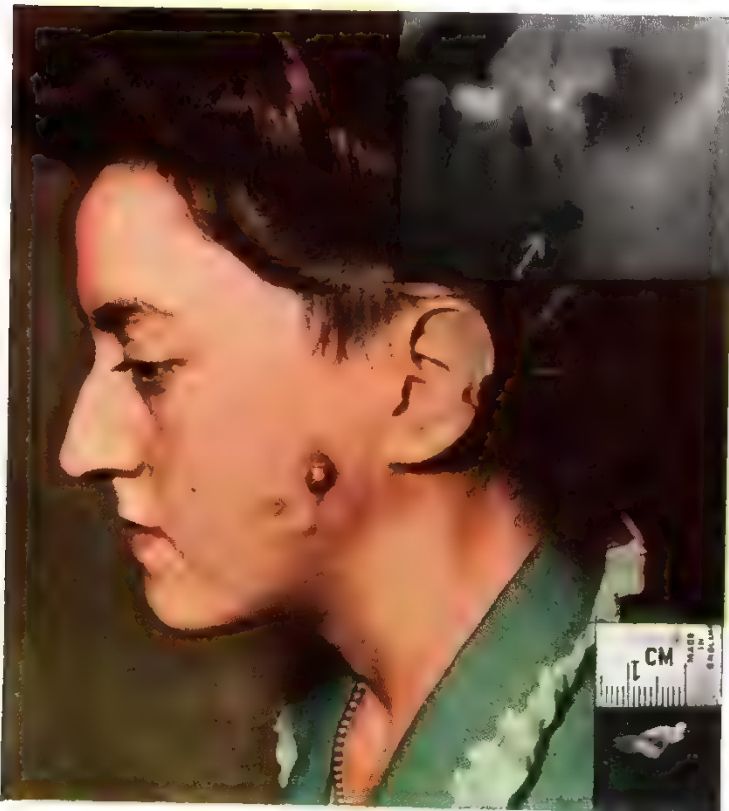
*Fig. 88.*—Exuberant granulation tissue around a sinus. Case of osteomyelitis of the sternum.

\* *Trophic*. Greek, τροφικός = appertaining to nutrition.

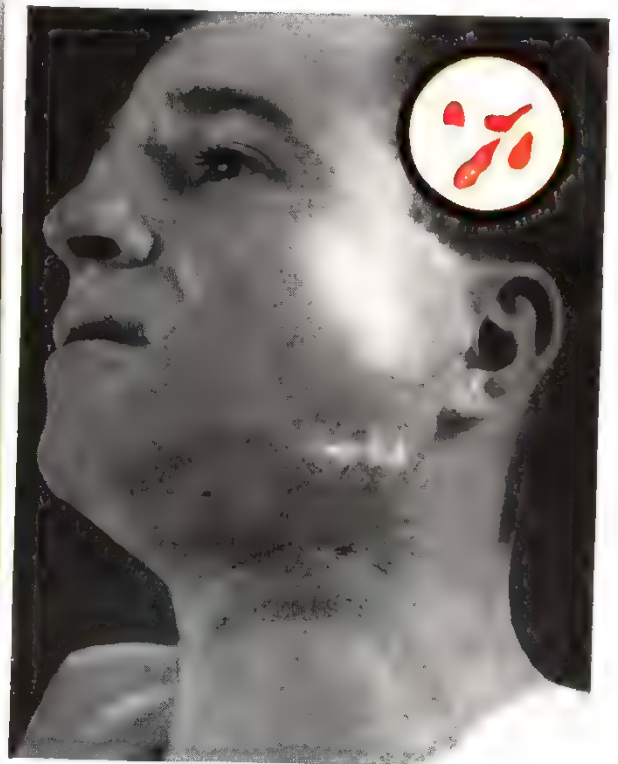
The opening of a sinus may be situated at a distance from the underlying pathological lesion. A case in point is shown in *Fig. 87*. An opening near the anus almost always is the external opening of a tunnel which has an internal opening into the anal canal or rectum (*FISTULA-IN-ANO*, see p. 281).

*A Sinus originating in Infected Bone.*—A point of great clinical significance is exuberant granulation tissue ('proud flesh') around the orifice (*Figs. 88, 89*). Sometimes this signifies that necrosis of bone is proceeding in the depths of the sinus. The cause of exuberant granulations is a foreign body—any foreign body—an infected non-absorbable suture is now the commonest.

The only clinical method of determining the length and direction of the track of a sinus is by probing, and this can be performed safely provided the probe has been sterilized and is used with great gentleness.



*Fig. 89.*—Sinus overlying the mandible resulting from a dental root abscess (upper inset). The patient was referred to hospital as a case of parotid gland fistula. The lower inset shows the sequestrum extracted through the sinus, after which it healed rapidly.



*Fig. 90.*—Actinomycosis of the neck. Pus expressed from one of the sinuses showed cayenne-pepper granules (the little dots within the drop of pus shown in the inset).

*A Sinus or Sinuses caused by Actinomycosis.\**—Multiple indurated sinuses, especially about the lower jaw and neck, suggest *actinomycosis* (*Fig. 90*). Express a little of the discharge into a test-tube half full of water. Cork the tube and shake vigorously. If cayenne-pepper granules (*Fig. 90*, inset), so characteristic of actinomycosis, are present, they will soon sink to the bottom of the test-tube.

**The Physical Characteristics of a Purulent Discharge** are of very limited value in suggesting the causative organism, bacteriological examination always being

\* *Actinomycosis*. Greek, ἀκτῖνος = a ray + μύκης = fungus. The ray fungus.

required. Streptococcal pus from newly infected tissue is watery and only slightly opalescent; sometimes it is blood-stained. Actinomycotic pus is also inclined to be watery. Staphylococcal pus is yellow and of creamy consistency. Very reliable is the blue, or bluish-green, pus of infection by *Pseudomonas aeruginosa* (formerly called *Bacillus pyocyaneus*). The anchovy-sauce coloured pus from an amoebic abscess of the liver is very characteristic.

**Odour emanating from a Discharging Sinus.**—Pus resulting from the activity of certain micro-organisms emits an odour; thus an infected wound, the seat of gas gangrene, emits a peculiar sickly-sweet odour, likened to decaying apples. An objectionable odour emanating from a discharging abdominal sinus or from a specimen of pus is likely to be diagnosed as '*B. coli* pus'. In fact pus resulting from the activity of *Escherichia coli* is absolutely odourless. The odour is due to the proteolytic propensities of certain anaerobic organisms derived from the lower alimentary tract, or less frequently to *Proteus vulgaris*.

Infection by bacterioides (which are not uncommonly the predominating organisms in cases of intra-abdominal suppuration and infections of the abdominal wall) gives rise to an odour similar to that of over-ripe Camembert cheese.

**Faecal Fistula.**—So often a 'faecal' fistula is reported when it is not fluid faeces, but foul, faecal-smelling pus that has been discharged from an abdominal wound; exceptionally such pus contains small bubbles of gas. Conversely, the passage of large bubbles of flatus with the discharge is unmistakable, and proof-positive that there is a communication with the bowel.

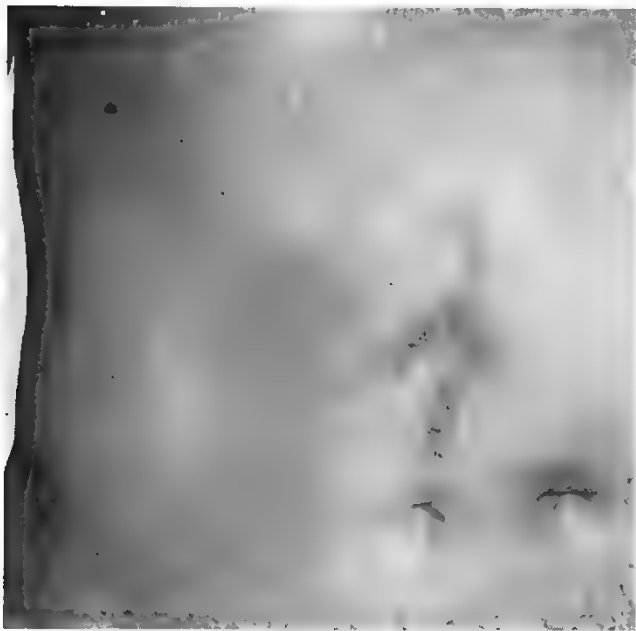


Fig. 91.—Ragged scar resulting from operative treatment of a perforated duodenal ulcer in the pre-antibiotic era.



Fig. 92.—This coloured patient was stabbed in the abdomen with a knife sustaining penetrating injuries of the small bowel. Severe sepsis followed operative treatment and an incisional hernia resulted. Note also the keloid scar.

### SCARS

Much can be learnt from careful study of a scar, particularly an abdominal scar. Usually a patient is aware of the nature of a previous abdominal operation,



but if not, a guess as to its nature can be hazarded from the site of the scar, e.g., the customary grid-iron appendicectomy scar in the right iliac fossa.

A fine linear scar, whether on a limb or the abdomen, implies an operation wound which healed without sepsis. Such a scar is virtually invisible and cannot be reproduced photographically. In contradistinction, a wide ragged scar indicates a septic wound (*Fig. 91*). Such an abdominal incision if short is likely to heal soundly, whereas if long an incisional hernia becomes a possibility or even a probability (*Fig. 92*). Moreover, if a patient with this type of scar presents with intestinal obstruction an adhesion figures high on the list of likely causes (consequent on intraperitoneal sepsis).



*Fig. 93.* —Keloid developing in a scar following a burn.



*Fig. 94.*—The patient stated that a lump had been removed 3 months previously, but had returned. The lump is in the subcutaneous tissue. Case of dermatofibrosarcoma protuberans (a relatively benign form of fibrosarcoma).

Another complication of sepsis following an accidental or operation wound is keloid\* thickening of the scar (*Fig. 93*). Coloured races are particularly prone to this (*Fig. 92*) even in the absence of sepsis. An intracutaneous lump which simulates keloid without the patient having undergone an operation previously is likely to be an example of dermatofibrosarcoma protuberans (*Fig. 94*).

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\* Keloid. Greek,  $\kappa\eta\lambda\eta$  = spot,  $\epsilon\iota\delta\omicron\varsigma$  = form.

## CHAPTER V

## SOME DISTINCTIVE STATES

## SHOCK

SHOCK, more descriptively called 'peripheral circulatory failure', is a state that is met with frequently in surgical practice. This is not the place to discuss its aetiology. The simple concept that it is basically due to diminished blood-volume (oligaemia) can be accepted here. The main signs are as follows:—

*The patient lies still*, paying little or no attention to events around him. Rather, he stares aimlessly and apathetically straight before him. Disturbed, he will move a little, and will answer questions in a weak voice; the necessity for repeating questions often arises. Left undisturbed, he soon reverts to his former state of lethargy.

*The pupils are dilated*, and react slowly to light.

*His colour is pale*, and is often described as grey. Pallor is present because there is less blood than normal in and beneath the skin; grey, because what blood there is, being stagnant, contains less oxygen than usual. Sometimes in profound shock this leads to marbling of the skin of the back of the hands and the front of the legs, and to cyanosis of the lips.

*Beads of sweat* are often perceptible, especially on the forehead and the upper lip.

*The pulse*: Typically the pulse-rate is accelerated and feels 'thready' i.e., less forceful than normal: this is relatively more striking than the increased rate.

*The temperature* is below normal.

*The blood-pressure* is lower than usual for the particular person.

*The urine* is reduced in quantity and its specific gravity is raised.

Such is the typical overall picture of established shock. There are, however, exceptions —not infrequently misleading exceptions.

In shock, especially that occurring in a person previously in perfect health, even an estimation of blood-pressure, which is the best measurement of the degree of shock easily available, is not always reliable. A barely palpable pulse is instinctively assumed to be a sign of low blood-pressure, but in this instance it can be due to arterial vasoconstriction, in which event the central blood-pressure may in fact be above normal: soon after an injury a rise in blood-pressure to over 140 mm. Hg is not uncommon (hypertensive pattern of shock). Another factor to be taken into consideration is that often there is no information available as to the patient's normal blood-pressure before the injury. In short, an estimation of the blood-pressure with a sphygmomanometer is not always to be trusted implicitly.

So it comes about that there are occasions on which every grain of clinical evidence that can be gleaned by physical signs is of value. *A reduced rate of blood-flow through the skin* can be made apparent, with practice, by the following method:—

Press the thumb against the sternum and hold it there. Then remove it quickly (*Fig. 95*). Normally the time required for the blanched area to turn pink is less than a second: in cases of early shock the reaction is noticeably longer (Price).

**Coldness of the extremities:** Coldness of the skin is best appreciated in the extremities. The best testing surface for delicate observations is the dorsal surface of the middle phalanx of the flexed finger.

In a hot climate, or if a shocked patient, before coming under observation, has been warmed with hot-water bottles or the like (a reprehensible practice), both the last two signs are likely to give negative results, even though the shock is profound.



Fig. 95.—In shock the skin remains blanched momentarily longer than normal.

**Observing superficial veins:** Inspect the dorsum of the hands and forearm. In established shock the normally visible veins will be less full than usual (collapsed) and on emptying them by upward stroking with a finger they fill more slowly than usual. To judge these criteria requires experience.

#### VARIETIES OF SHOCK

**Collapse due to Haemorrhage.**—If the patient has bled externally the source is usually obvious, e.g., a compound fracture. A more difficult question is, is the patient bleeding internally? Common examples are ruptured spleen (*see* p. 332), ectopic pregnancy (*see* p. 325), melaena due to bleeding peptic ulcer (*see* p. 305). This is one of the most momentous problems with which the diagnostician is confronted. Internal haemorrhage is sometimes difficult to recognize. As a result of haematoma formation around the bone-ends and into the muscles of the vicinity, the blood-loss in a case of multiple closed fractures may amount to several litres (Clarke).

**Pallor:** This outstanding and constant sign is due not only to blood-loss but to the concomitant vasoconstriction of cutaneous vessels. Such pallor may be so pronounced (*Fig. 96*) as to be discerned while approaching the patient. In less evident cases, especially in artificial light and/or when the clinician has not seen the patient previously, the presence of pallor is best ascertained by examining the conjunctiva of a lower lid and the finger-nails. Unless varnished, the finger-nails are the windows of the capillary network. In cases of doubt, press the finger-nail near its free edge; about half the nail-bed blanches. Release the pressure gradually; the pristine hue spreading from the base returns almost instantaneously. Compare the colour with that of your own finger-nail.

*The pulse:* While a progressive increase in the pulse-rate (*see* p. 6) is an unrivalled confirmatory sign of internal haemorrhage, considerable haemorrhage can occur before the pulse-rate *commences* to rise. This is demonstrated convincingly when a donor gives blood for transfusion: during and after the collection of blood the pulse-rate and the blood-pressure usually remain unchanged.

*Restlessness:* Due to cerebral hypoxia the patient seldom remains quite still, and tends to resent his arms and chest being covered by bedclothes.

*A feeling of want of fresh air,* which is sometimes interpreted by the patient as choking, occurs when the loss of blood is considerable. 'Air hunger', which implies actual gasping for breath, is seldom in evidence, but occasional sighing is not uncommon.

*Thirst* with repeated requests for something to drink is yet another reason for the absence of tranquillity.

**Burns Shock.**—The cause is obvious. In this instance the fluid lost is a plasma-like exudate through the burned tissues so there are no signs of anaemia, at least in the early stages.

**Septic (Bacteriaemic) Shock.**—Occurs in advanced peritonitis (*see* p. 318) and in severe infections (septicaemia—*see below*).



*Fig. 96.*—One-and-a-half hours after falling downstairs with a baby in her arms. Ruptured spleen.

### SEPTICAEMIA

Improvement in the treatment of sepsis with antibiotics has led to the survival of increasing numbers of patients who would have succumbed previously. At some stage during the postoperative period, signs of shock together with intermittent pyrexia and sometimes rigors, supervene. Often the skin is warm and dry ('pink shock'). The patient looks and feels ill; indeed his condition may come to resemble that of malignant cachexia (*see* p. 49). A few instances are seen after otherwise uneventful operations without evidence of wound sepsis but most follow urinary tract operations or infections.

Although the clinical signs of septicaemia should be looked for carefully,

an early blood-culture is easily the most important investigation.

**Enlargement of the Spleen.**—A minor enlargement (*see* p. 243) particularly should be sought.

A **Septicaemic Rash** (*Fig. 97*) or **Splinter Haemorrhages** under the nails are



*Fig. 97.*—Septicaemic rash following prostatectomy.



valuable confirmatory evidence. A good light is necessary for detection, but absence is not proof that the patient is not suffering from septicaemia.

### DEHYDRATION

Clinical manifestations appear when there is fluid depletion corresponding to 6 per cent of the body-weight (equal to about 4 litres in an adult weighing 70 kg.). In most instances dehydration involves a loss of electrolytes (mainly, if not entirely, sodium chloride) as well as water, and many of the signs of dehydration as seen in surgical practice are due to the loss of sodium.

In established cases the face is drawn and the eyes are sunken and the pressure in their anterior chambers is felt to be low. In infants the anterior fontanelle is

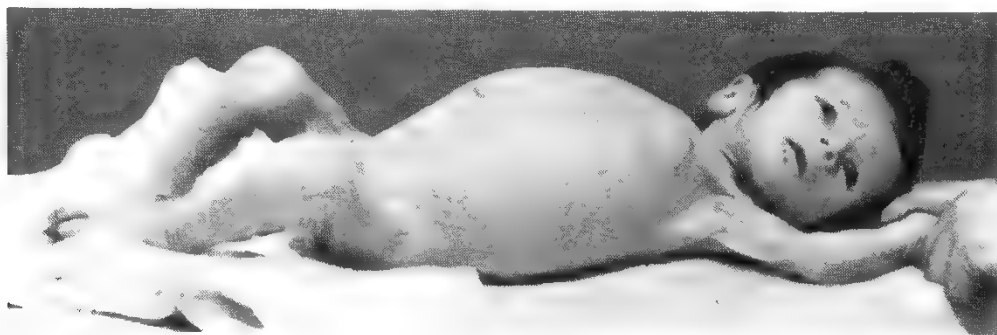


Fig. 98.—Dehydration. The sign of the ridge is apparent (left upper arm).

depressed. In all dehydrated patients the tongue is coated and dry; in advanced cases it is brown in colour. With dehydration produced by loss of water only, thirst is particularly in evidence. The skin is dry and often wrinkled, making the patient look older than his years. The subcutaneous tissue feels lax. If the skin of a considerably dehydrated person is picked up between the finger and thumb and then released, instead of it springing back with normal elasticity, a ridge is formed that subsides slowly—this is the *sign of the ridge* (Fig. 98). The peripheral veins are small, constricted, and contain dark blood. The blood-pressure is likely to be below normal. The urine is scanty, dark in colour, and of a high specific gravity.

**Sodium Depletion: Special Features.**—Excessive loss of fluid high in salt content occasioned by high intestinal obstruction with vomiting, or a duodenal or bile fistula, are almost invariably the antecedents. The features are those of dehydration described above with one exception; the patient is not thirsty.

**Potassium Depletion: Special Features.**—Diarrhoea, whether due to a 'surgical' condition, e.g., ulcerative colitis, or otherwise, e.g., cholera, is the usual cause. Potassium loss from a newly established ileostomy is often great. Loss of mucus from a large villous adenoma of the rectum (see p. 285) may also lead to potassium deficiency.

The patient is listless with slow slurred speech and drowsy. There is weakness of the voluntary muscles and the abdomen is distended, so much so, that in postoperative cases paralytic ileus or intestinal obstruction may be simulated.

Electrolyte estimations performed on the blood serum are necessary to confirm a diagnosis of the above two conditions.\*

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\* The diagnosis of water, sodium, and potassium excess are not dealt with as they are iatrogenic. *Iatrogenic*. Greek, *ιατρός* = physician + *γεννάν* = to produce. A morbid condition resulting from treatment.

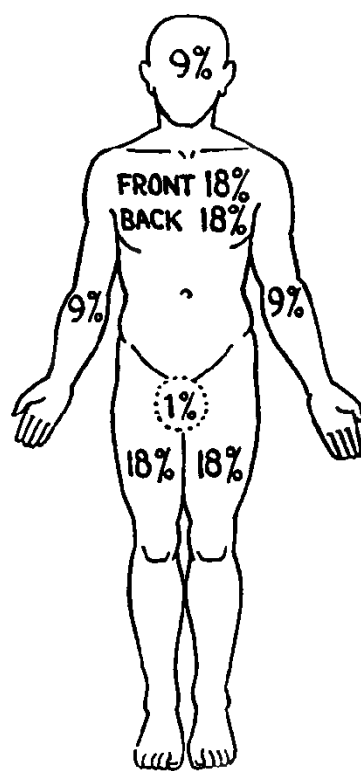
## BURNS

That the patient has been burnt is obvious. Diagnosis is not complete, however, without determining the extent and depth of the burn or scald. Without full diagnosis rational planned therapy is impossible. Of many methods for estimating the extent of a burn, Wallace's Rule of Nines (*Fig. 99*) is the simplest. Remember, that if areas of erythema are excluded, a burn of over 10 per cent of the body surface in children and over 15 per cent in adults will probably cause shock, and that it is important to adopt prophylactic measures before the signs described earlier in this chapter become apparent.

Another useful method of calculating the extent of a burn is to compare in one's imagination the size of the patient's outstretched hand and fingers with the burnt area. If, for example, 5 outstretched hands would cover the area, the burn is approximately 5 per cent of the body surface (i.e., a hand = 1 per cent).

**Depth of the Burn.**—At each extreme, diagnosis is easy. A first-degree burn (erythema) looks like severe sunburn. There is no mistaking the dead-white appearance of the completely destroyed skin of the third-degree burn. Comparatively rarely is charring of the skin and deeper tissues seen. The difficulty lies in deciding whether part of the epithelium remains alive and is capable of regeneration, thereby obviating the need for skin-grafting.

**The Pin-prick Test (Jackson).**—Using sterile hypodermic needle, test pain sensation (*see p. 411*) in the burnt area. If pain is present in all or part of the burn, that part is second-degree and will heal in approximately three weeks. The converse is not necessarily true; analgesia usually indicates full-thickness skin loss, but the end-organs for pain may be destroyed in deep second-degree burns with survival of some epithelial cells deep to them. Thus some second-degree burns, not requiring skin-grafting, are analgesic and may be diagnosed as third-degree.



*Fig. 99.*—The Rule of Nines; the head and upper limbs each equal 9 per cent; the front and back of the trunk and the lower limbs each equal  $2 \times 9$  per cent. In children the head is relatively larger, its surface comprising up to 18 per cent in infancy.

## CYANOSIS

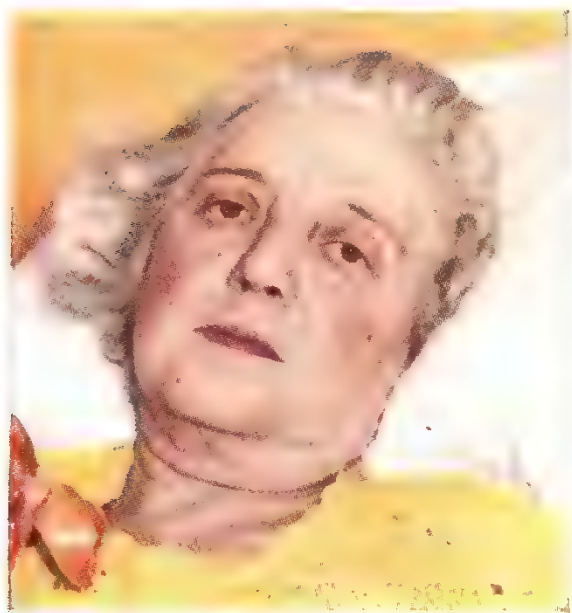
The most usual form of cyanosis is dependent solely upon inadequate oxygenation of haemoglobin. At no time does the carbon-dioxide content of the blood play any part in this visible colour change. The degree of cyanosis is not always an accurate index to the severity of the anoxia present.

For example, when the haemoglobin content of the blood falls as low as 30 per cent (less than 5 g. per 100 ml. of blood) cyanosis does not appear, even if all the haemoglobin were in a reduced state, because a minimum of 5 g. per 100 ml. is required to produce visible cyanosis.

Again, peripheral vasoconstriction, by reducing the amount of blood in the surface vessels, is wont to prevent cyanosis being perceived even though a dangerous degree of anoxia is present. Thus severe oxygen-want can prevail without cyanosis being apparent.



Although a mild degree of cyanosis is best perceived in the lips (*Fig. 100*), the lobules of the ears and the finger-nails also should be examined in suspected cases. Even experienced clinicians vary in their ability to recognize faint blueness, for this depends, not on clinical acumen, but upon acuteness of colour perception—a very variable factor. Moreover, cyanosis is notoriously difficult to detect in coloured races. Lastly, cyanosis of a lilac hue can exist without oxygen-want, and every surgical clinician will do well to be cognizant of two forms of cyanosis that are not dangerous and do not call for a freer air-way, oxygen, or indeed any elaborate form of therapy.



*Fig. 100.*—Marked cyanosis.

*a. Cyanosis due to cold*, producing local capillary stagnation, can be most evident in the lips, nose, hands, and feet without anoxia of the blood within the arterial tree.

*b. Drug Cyanosis.*—Cyanosis of varying intensity is occasionally met with in patients undergoing sulphonamide and other therapy.

## OBESITY

An excessive deposit of fat is apt to obscure intra-abdominal physical signs; it increases the difficulty of many operations, and the incidence of postoperative complications is higher in the fat than in the lean. Therefore obesity is more important to the surgeon than to the life-assurance assessor. Dr. Samuel Johnson\* is reported to have said: 'Sir, it is plain that if he is too fat, he has eaten more than he should have done.' In other words, in the vast majority of cases obesity is due to the ingestion of more calories than are needed for energy. The habit of overeating is usually familial as a glance at the parent of a fat child will confirm. In spite of this super-simple doctrine, it is still necessary to winnow the fatness of endocrine disorder from that of overeating.

**1. Hyperinsulinism.** Obesity may develop in individuals with functional or organic (insulin-producing adenoma of the islets of Langerhans) hyperinsulinism. These patients learn that the symptoms of hypoglycaemia can be controlled by the ingestion of food.

**2. Hyperadrenocorticism.**—While as a rule a deposit of fat on the trunk, and not on the limbs (*Fig. 101 A*), has no aetiological significance, hyperadrenocorticism (Cushing's syndrome) should be thought of. In most cases the obesity of Cushing's syndrome has an abrupt onset. The face is rubicund (*Fig. 101 B*) and the shape is like that of a full moon. Exceedingly characteristic are purple-red striae distenditiae, mostly on the abdomen (*Fig. 102*). As the disease progresses, so the general contour becomes more and more that of a lemon on match-sticks, viz.

The wave of enthusiasm for treatment of various disorders with steroids has brought a considerable toll of additional cases.

**3. Hypothyroidism** should be considered if other signs of that disorder (*see p. 160*) are present, but it is not a cause of extreme obesity.

**4. Hypogonadism** in children and adolescents is a cause of obesity (*Fig. 101 C*). Only rarely is the condition caused by a tumour in the hypothalamic region (craniopharyngioma), in which case



\* SAMUEL JOHNSON, 1709–1784, celebrated lexicographer, was an LL.D. Dublin.

the term 'Fröhlich's adiposogenitalis syndrome' is accurate. It may follow a fractured base of skull but usually the condition is a probable variation of normal development. There are also a number of rare syndromes due to genetic defects which present with obesity and abnormal sexual development: the reader is referred to textbooks on endocrinology for descriptions of these.

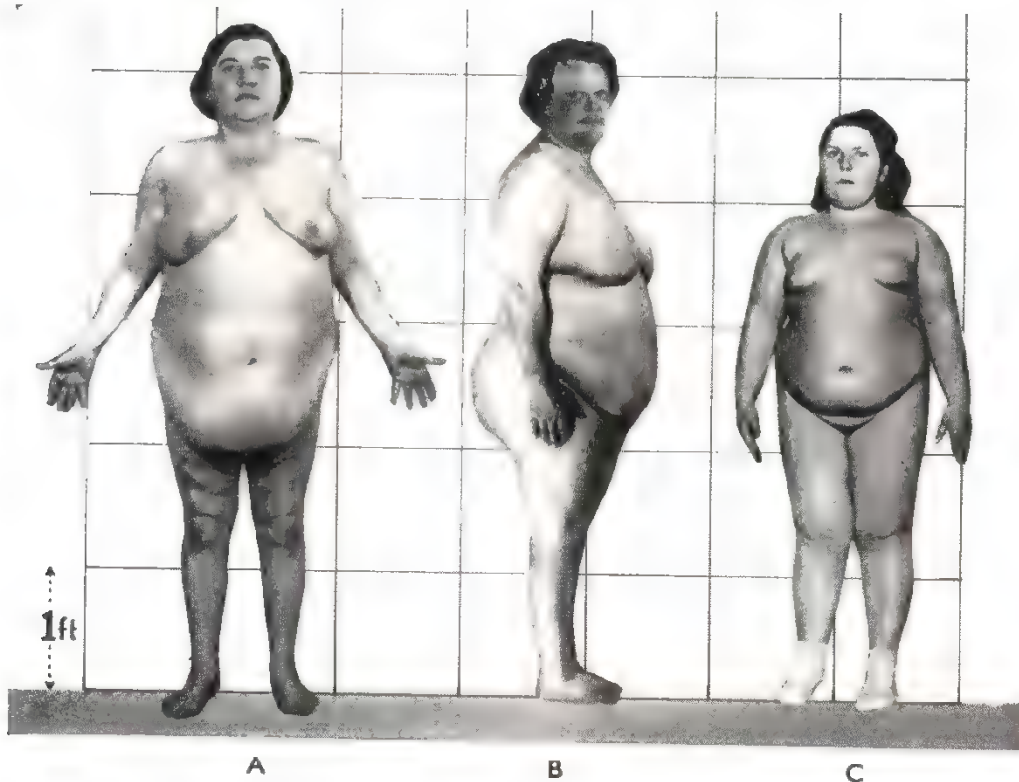


Fig. 101.—A, Fatty 'apron', simple overeating; B, Cushing's syndrome; C, Hypogonadism (note the knock-knees).

As a rule simple inspection and pinching up of the skin is sufficient to diagnose obesity.

#### LOSS OF WEIGHT: MALIGNANT CACHEXIA

That the patient has recently lost weight is suggested by his clothes, particularly the waist of the trousers, being too commodious.

Malignant cachexia is characterized by the emaciated, languid, sallow, often pallid facies, loose and wrinkled dry skin, loss of energy, appetite, and weight, and often infection of the mouth with thrush. More often than not a sufferer from malignant cachexia experiences little or no pain, and is apparently unaware of the grave implications of the profound loss of weight. Some seem almost optimistic, and on no account must this oblivion be dispelled by an unguarded word or a despondent facial expression or gesture. Often, too, the abdomen does not share in the obvious attenuation, but rather there is a fullness due to ascites (*see p. 250*).



Fig. 102.—Striae distensae on the abdomen of a woman with Cushing's syndrome.

Why is it that advanced malignant disease is so frequently unaccompanied by pain? Cancer is a painless condition unless there is obstruction of a hollow muscular organ causing colic, or bone metastases are present, or the growth infiltrates a sensory nerve. Ignorance of this, both by the general public and by some doctors, is an important cause of delayed diagnosis.

### NEUROSIS

As in medicine, so in clinical surgery sometimes a suspicion arises that the patient's symptoms are functional, as opposed to organic, or, in the case of a wound (operation or otherwise) that will not heal, that the patient is deliberately



*Fig. 103.*—The patient had a recently healed superficial scar in the palm of his right hand, for which he was claiming compensation. The skin of his right hand, arm, and forearm was anaesthetic ('glove' anaesthesia) and he actually smiled while the five pins shown were thrust through the skin distal to the line marked by the pencil. Proximal to this line (X) a touch of the point of a pin caused him to cry out.

tampering with it (*see p. 542*). As it is impossible to do justice here to this vast subject, all that will be attempted is to direct attention to a few practical points.

A conclusion that symptoms are due to a neurosis should not be reached

until (1) the presence of relevant organic disease has been excluded by every means available; (2) positive signs of a functional disorder are present.

All too frequently, after years of observation of a patient with symptoms which must have been neurotic, fresh symptoms or signs develop which on investigation prove to be due to organic disease, very often malignant. The clinician must be on guard always to avoid missing the change in symptomatology, however tiresome the patient.

Among the most extraordinary purely functional phenomena is that known as glove and/or stocking anaesthesia. The patient says the limb is numb. That he is correct there can be no doubt, for one can transfix the skin with pins (*Fig. 103*) or test for pain sensation by pinprick and the patient does not mind. However, the area of anaesthesia ends abruptly at a certain level not in keeping with any anatomical distribution of nerve-supply.

Usually cases seen by the surgeon cannot be proved to be functional so easily. As aids to arrival at this difficult conclusion the following tests are helpful to some extent:—

1. Test the knee-jerks. They are likely to be exaggerated.
2. Touch the soft palate with a blunt object. Normally, this will cause the patient to gag unless he usually wears dentures. The patient of neurotic temperament allows the clinician to stroke his soft palate with impunity.
3. Perhaps the most difficult neurosis with which the surgeon has to contend is the hysterical joint. This usually takes the form of 'locking'. The joint is fixed in some degree of flexion. It is sometimes possible, by suddenly diverting the patient's attention, to release the joint and extend it.

## CHAPTER VI

## THE HEAD

## THE SCALP

**Scalp Wounds** never gape unless the aponeurosis (galea\* aponeurotica) has been divided. Thus it can be told at a glance whether this structure has been implicated; if it has a compound fracture must be sought in the operating theatre.

**Haematoma.**—A collection of blood (or pus) beneath the aponeurosis (dangerous area) tends to involve the whole area between the attachments of the occipitofrontalis muscle and fluctuation can be detected over the entire scalp, from the frontal to the occipital regions. On the other hand, an effusion beneath the pericranium is limited by the suture lines, and is therefore confined to the area of one cranial bone. In the newborn such a swelling (*cephalhaematoma*) is usually found over the parietal bone. A subpericranial haematoma is often exceedingly deceptive to the palpating fingers: *it feels exactly like a depressed fracture*, because the peripheral part of the swelling is firm from coagulation of the blood, while the centre remains soft.

**Haematoma connected with a Fracture of a Parietal Bone in a Child** is not infrequent. A parent brings a child some days after a fall upon the head, having discovered a lump on the side of the head. There is a soft cystic swelling on one side of the head, not bounded by any of the suture lines of the skull. A radiograph reveals a linear fracture of the parietal bone (Ellis).

**Cellulitis of the Scalp.**—The scalp becomes swollen and boggy, and unless arrested, the infection spreads widely. One (*Fig. 104*) or both eyelids and, perhaps, the pinna on the affected side become swollen. The regional lymph-nodes (*see p. 54*) soon become enlarged and tender.



*Fig. 104.*—Cellulitis of the scalp.

**A Localized Swelling in the Scalp** can be made to move on the skull (*Figs. 105, 106*); conversely, the scalp can be made to move over a swelling springing from the skull.

**Sebaceous Cysts** of the scalp (*Fig. 105*) are common. Sometimes they are single; often they are multiple so always examine the whole scalp carefully.

**Cock's 'Peculiar' Tumour** looks like a squamous-celled carcinoma; in the case illustrated in *Fig. 106* it bled easily, too. It is a suppurating and ulcerating sebaceous cyst.

**A Lipoma** which is situated over the vertex, although apparently a localized swelling of the scalp, is wont to occur *beneath* the

\* *Galea*. Latin = a helmet.



pericranium, and consequently its margins can be rolled on the surface of the bone (*see* the slipping sign, p. 23).



Fig. 105.—Sebaceous cysts of the scalp, sometimes called 'wens'.

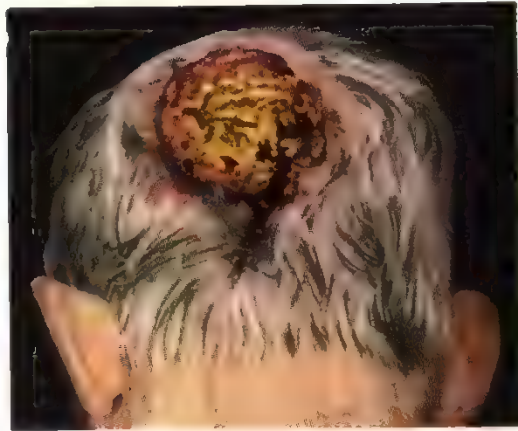


Fig. 106.—Cock's 'peculiar' tumour.

**'Turban' Tumour** (Fig. 107) is a rare, locally malignant, relentless tumour (cylindroma) of the *skin* of the scalp that in the course of twenty years or more spreads over almost the entire scalp (Fig. 108) and even hangs in festoons from it. Reddish in colour, lobulated with deep crevices, and devoid of the hair of the head, its appearance is so characteristic that it can hardly be mistaken. Nevertheless it must be distinguished from a:—

**Plexiform Neurofibroma**, which occurs *beneath* the skin. When large, it too hangs in festoons, but it is, as a rule, covered by hair unless it is ulcerated by repeated friction and difficulty in keeping it clean. More often than not this is a part of von Recklinghausen's neurofibromatosis (*see* p. 29).



Fig. 107.—'Turban' tumour at an early stage.

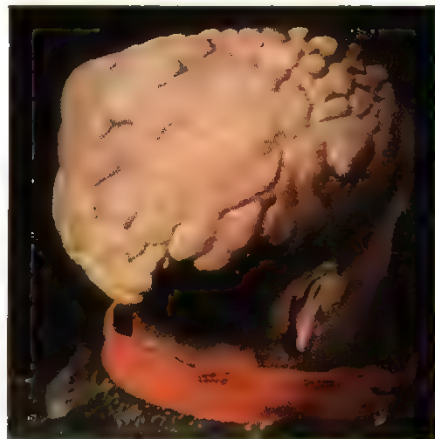


Fig. 108.—Typical 'turban' tumour of the scalp present for many years.

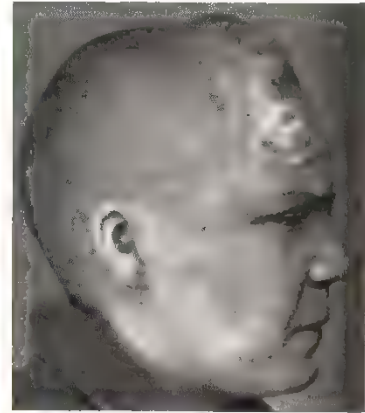


Fig. 109.—Cirroid aneurysm of the scalp. On auscultation a bruit was easily heard.

**Temporal Arteritis.**—The patient, who is usually over 65 and more frequently female, complains of intense headache which may have resulted in weight-loss. The involved temporal artery is tender and reddened due to a segmental low-grade inflammatory arteritis. Occasionally the occipital or posterior auricular arteries are also involved.

An obscure cystic swelling implicating the scalp should be watched carefully for pulsation. The sign of emptying (*see* p. 24) (meningocele, cavernous haemangioma,

and sinus pericranii\*), the application of a stethoscope (bruit of a cirroid aneurysm) (*Fig. 109*), and percussion of the swelling (pneumatocele, *see p. 60*), may have a place in the elucidation of the diagnosis.

**The Lymphatics of the Scalp** drain as follows:—

*Occipital Region.*—First into the nodes on the insertion of the trapezius, then into those of the posterior triangle.

*Mid-parietal Region.*—First into the post-auricular lymph-node, and thence into the nodes of the posterior triangle.



*Fig. 110.*—Bilateral enlarged lymph-nodes (←) of the posterior triangles due to an infected abrasion of the scalp (↗) caused by an elastic hair-tidy (inset).

*Forehead and Anterior Parietal Region.*—Into the pre-auricular lymph-node.

Enlarged lymph-nodes situated only in the posterior triangle of the neck are most unusual apart from in German measles, a common cause unlikely to be seen by the surgeon. Low-grade infection of the scalp due to *pediculosis capitis* or an infected abrasion is prone to give rise to lymphatic enlargement which simulates closely that produced by Hodgkin's disease. To add to the deception, the primary lesion, hidden by the hair of the head, is especially liable to be overlooked (*Fig. 110*).

## THE SKULL

**The Anterior Fontanelle.**—As a rule the anterior fontanelle becomes closed by the time the infant has reached the age of eighteen months. During the first year of life an open fontanelle is a gold-mine of clinical information. Like the eyeball, it has a normal tension which can be estimated by pressing the fingers gently over the lozenge-shaped space. When the child cries, the tension is increased noticeably. In shock the normal tension is diminished. In dehydration by diarrhoea and vomiting, the fontanelle is depressed, often visibly. Considerable delay in closure is seen in several metabolic diseases, notably rickets, of which it is contributory evidence.

\* Sinus pericranii. A soft swelling beneath the scalp communicating with a venous sinus through a defect in the skull.

THOMAS HODGKIN, 1798–1866, *Curator of the Museum at Guy's Hospital, where he failed to obtain the post of Physician. Thenceforth, abandoning medicine, he devoted his life to missionary work.*

**Meningocele** is less common than its spinal counterpart (*see* p. 204) and usually it occurs in the midline. By far the most common location is through a defect in the occipital bone, although it may be found over the vault. The pouch of dura mater which comprises a meningocele may be pedunculated or sessile; it is covered either with the full thickness of the scalp or by epithelium only. The swelling to which it gives rise (*Fig. 111*) is tense, rounded, fluctuant, translucent, and yields an impulse when the child cries.

**Pond Depressed Fracture of the Skull** is usually encountered in a neonate, and is consequent upon extreme moulding of the head during delivery or, more frequently, is a result of the application of obstetric forceps (*Fig. 112*). It can occur also during the first few months of life from a fall, or other direct injury. Such dents are comparable to greenstick fractures of long bones.



*Fig. 111.*—Occipital meningocele.



*Fig. 112.*—Pond depressed fracture.



*Fig. 113.* — Five-month-old child with untreated hydrocephalus. The somewhat bulging eyes are downcast ('setting sun' sign); the child appears always to be looking towards the floor (pressure on the orbital plates).

**Craniosynostosis.**—Cranial bones are normally separated from one another at the time of birth. A firm fibrous union between them usually occurs by the fifth or sixth month of life, but bony union is not completed until after the sixtieth year. When one or more of the cranial sutures becomes prematurely closed, particularly before birth, deformity of the cranial vault results. Such deformities sometimes become extremely grotesque, and, as during the first year of life the brain increases 135 per cent in weight, the constriction of the brain by this happening is the cause of a 'sugar-loaf' or 'steeple' skull with, perhaps, convulsions, mental retardation, proptosis, and visual disturbances.

**The Circumference of the Head.**—Until a child is eighteen months of age, the circumference of the head is approximately equal to that of the thorax. This ratio is disturbed, on the one hand, by craniosynostosis and other forms of microcephaly and, on the other, by hydrocephalus. When an infant's head appears abnormally small or large, measurements of the girth of the skull at the level of the top of the pinnae and of the thorax at the nipples should be taken and compared.

**Hydrocephalus** (*Fig. 113*).—The anterior fontanelle, normally approximately 3 cm. longitudinally and 2 cm. transversely at birth and progressively decreasing in size with age, is enlarged and tense. The superficial veins of the scalp are very conspicuous, which is a valuable sign in early cases of hydrocephalus or, for that matter, increased intracranial tension from any cause in infancy. The sutures

may be palpably separated. Three in four cases are associated with meningocele (see p. 204). (See also Arnold-Chiari Malformation, p. 205.)

*The 'Setting Sun' Sign.*—As seen in Fig. 113 (which is an extreme example) the sclera is visible above the cornea at all times when the eyes are open. This sign is present in early cases even before the head circumference increases.

In an adult, especially a man past middle-age, a large cranium should incite a suspicion of:—

**Paget's Disease of the Skull.**—In addition to an examination of the trunk and the limbs (see p. 435) the head should be auscultated, for the thickened cranial bones are extremely vascular, and sometimes a systolic bruit is audible.

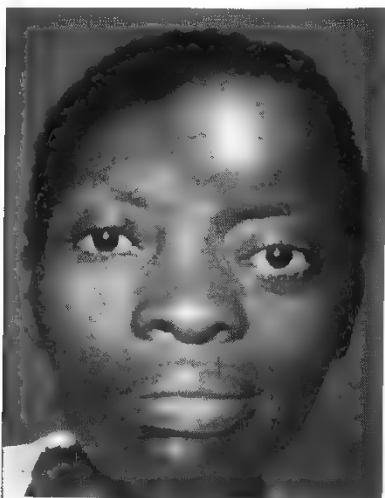


Fig. 114.—Pott's puffy 'tumour', secondary to frontal sinusitis

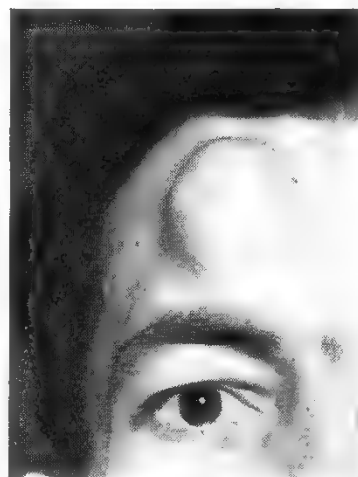


Fig. 115.—A bone metastasis which felt stony hard and originated from a neuroblastoma.

**Pott's Puffy 'Tumour'** (Fig. 114) is a localized oedema over an area of osteomyelitis of the skull. In the frontal region it is due to imperfectly treated acute frontal sinusitis. About ten days after the onset considerable pyrexia with severe pain and tenderness over the sinus strongly suggests osteomyelitis. In other parts of the vault a haematoma may become infected.

**Osteomyelitis of the Vault.**—Bone infection usually follows inadequate treatment of a compound fracture. The infection is low grade and should be suspected if a sinus or sinuses persist. A retained foreign body may be the cause of the infection or a sequestrum may form and be extruded.

**Tumours of the Skull.**—Any of the bone tumours mentioned in Chapter XXVIII are occasionally seen. Exact diagnosis usually depends on biopsy.

**Osteoma.**—A favourite site of an osteoma is the outer table of the skull. It occurs in the frontal, parietal, or occipital bones, and projects as a mound of stony-hard consistency.

**Secondary Carcinoma** is by far the most common tumour of the skull. It commences in the diploë, and is a blood-borne metastasis. The consistency varies from stony hard (Fig. 115) to very soft, depending on its vascularity. Some extremely vascular metastases show pulsation.

**Meningioma**, although it usually remains within the skull, occasionally forms a sessile swelling over one of the bones of the vertex. The swelling is bony-hard in consistency. It is impossible by clinical means to distinguish it from primary or secondary bone tumours.

## INTRACRANIAL LESIONS

To the general surgeon easily the most important pathological condition affecting the head is the injury resulting from trauma to the brain and intracranial blood-vessels. Owing to the rigid skull, diagnosis must often be inferred from the signs resultant on the brain damage rather than by direct examination, although this has its place. The surgeon is thus attempting the diagnosis and localization of an acute space-occupying lesion (blood-clot), whereas the neurologist is more concerned with chronic space-occupying lesions (usually neoplasms). The refinements of diagnosis of the latter do not, in ordinary circumstances, concern the general surgeon, and the medical student will be, or should be, taught the elements of neurological diagnosis on the medical wards.

In this section, therefore, only certain signs which may be found in patients suffering from trauma to the head will be considered.

It must be emphasized at the outset that, with brain injuries, the main presenting features are loss of consciousness, of lesser or greater duration and degree, and restlessness, which make localizing signs, if present, difficult to interpret. Such signs as are present, therefore, often act as an indication that active surgical treatment is necessary rather than as a pointer to the site of the lesion (blood-clot). The loss of function of a cranial nerve *at an early stage* usually implies its damage, complicating a fractured base of skull.

## EXAMINATION OF A CASE OF RECENT HEAD INJURY

Unless there is an obvious compound fracture of the vault, which should no more be missed than any other compound fracture, a single examination is seldom conclusive, and before it is possible to ascertain what damage has been sustained and/or to judge if progressive changes are occurring, the patient must be visited many times at frequent intervals. In this connexion there is no better incentive than to remember the aphorism of Hippocrates that *No head injury is so slight that it should be neglected, or so severe that life should be despaired of*. The findings at each visit must be recorded. In all cases radiographs of the skull should be taken at the first opportunity compatible with safety, and their findings correlated with the clinical examination. Except in cases of mild concussion, which have been admitted for observation as a safety measure, the whole scalp must be shaved at the earliest opportunity. The locality of a bruise together with the site of a fracture (if seen on a radiograph) taken together constitute the most important single clue in indicating where an intracranial haematoma is situated.

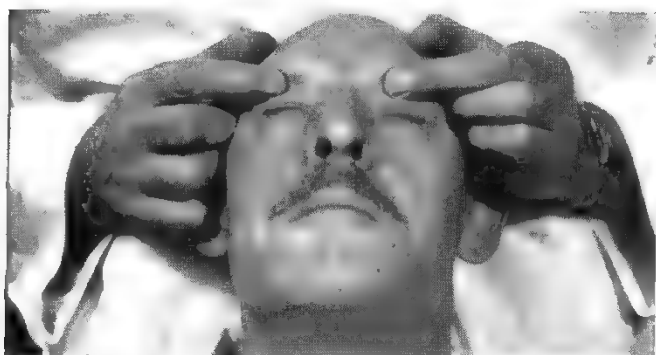
**1. The Patient is Unconscious.**—Examine the scalp for a wound or local bruising or haematoma. Inspect the nostrils and back of the throat (compound fracture of the anterior cranial fossa) and the external auditory meatuses (compound fracture of the middle cranial fossa) for evidence of blood diluted with cerebrospinal fluid. In practice it may be extremely difficult to prove that there is such a mixture and in cases of doubt it is wise to assume that cerebrospinal fluid is present and to adopt the necessary antibiotic treatment. Compare the size of the pupils and test their reaction to light. *Make a general survey of the body for other injuries*, especially for fractures and abdominal and thoracic injuries.

*Coma* is a state of absolute unconsciousness in which the patient does not respond to any stimulus. The reflexes are absent, including the corneal and



swallowing reflexes. In *semi-coma* the patient responds only to painful stimuli and reflexes are present. To some extent the depth of unconsciousness can be judged by exerting pressure over the supraorbital nerves. Supraorbital pressure, if properly applied (*Fig. 116*), is exceedingly painful, and all but deeply unconscious patients will respond to it by contracting the facial muscles of the corresponding side. Alternatively, rubbing the knuckles against the ribs in the axillae is an excellent substitute.

Search for paralysis. Pick up the arms and legs and allow them to fall. One side may be more flaccid than the other. If this is the case, it is likely that there is a cerebral lesion on the opposite side. Pinch the soles of the feet; as a result, one leg may be drawn up while the other is not. This is a good test for determining if there is unilateral paralysis in an unconscious patient.



*Fig. 116.*—Exerting pressure over the supraorbital nerves. The left nerve is being compressed.

Palpate and percuss the hypogastrium for evidence of an overfull bladder.

The temperature, pulse-rate, and respiratory-rate must be charted

every half-hour; similarly, a behaviour chart must be kept at half-hourly intervals by the nurse or doctor, recording the state of consciousness and the patient's response to stimuli, questions, etc.

Following a head injury, vomiting is a common occurrence, and inhalation of vomitus is a frequent cause of death. Therefore, after the examination it is imperative to place and have the patient kept on his side, with a clear airway (by removing blood and mucus) during the whole of the subsequent period of observation. Due consideration should be given to the necessity for inserting an endotracheal tube. Re-examine in one hour, or before this time if called upon to do so by the nurse in charge.

**2. The Patient is Conscious or Semi-conscious.**—Should the patient be mentally confused, the degree of confusion at the time of examination should be recorded.

*Stupor.*—No sensible answers can be obtained, but now and then simple commands forcibly given, such as 'Hold my hand', will be obeyed.

*Delirium.*—Although out of touch with his surroundings, relevant answers to obvious questions such as 'How old are you?', 'What is your work?' will be forthcoming. However, he is irritable when disturbed, may be aggressive, noisy, and try and get out of bed.

*Confusion.*—Some degree of coherent conversation is possible.

If it has not been done already (when the patient was unconscious) carry out the examination detailed on p. 57. In addition, make a survey of the integrity of the cranial nerves, as described below.

#### EXAMINATION OF THE CRANIAL NERVES

When the patient is conscious the following procedures can be undertaken. In a fair proportion of head injuries cranial nerve damage (often transient) is found.

**1st (Olfactory) Nerve.**—In lesions (abscess or tumour) involving the deep inferior part of the temporal lobe, hallucinations of smell are not infrequent; as a rule these are unpleasant. Complete anosmia is a frequent sequel to fractures involving the cribriform plate of the ethmoid. Smell must be tested on each side by occluding first one and then the other nostril. For the test highly volatile substances should be avoided; ground coffee is satisfactory.

**2nd (Optic) Nerve.**—*Visual Fields:* Gross defects can be detected by a simple examination. The clinician and the patient face one another. While the left eye is tested, the patient covers his right eye with his right hand, and the examiner covers his own left eye with his left hand. The patient fixes his left eye on the pupil of the examiner's right eye. The test object consists of a ball of cotton-wool attached to a wooden spatula. The field of vision is ascertained by moving the test object laterally, medially, and up and down.



Fig. 117.—Injury to the third nerve. Note the ptosis and external strabismus on the left side. The patient fell from his motor-cycle and, striking his head, sustained a fracture of the anterior cranial fossa.



Fig. 118.—Paralysis of the right fourth nerve following a head injury. When the patient looks downwards and to the left he suffers diplopia. The illustration shows the lack of rotation of the right eyeball as compared with the left.

**3rd (Oculomotor) Nerve.**—*Movement of the Lids:* There is ptosis on the affected side (Fig. 117). *Eye Movements:* On asking the patient to look ahead the affected eye deviates outwards (Fig. 117).

The following reactions are also lost: -

*Reaction of the Pupil to Light.*—The patient is instructed to look at a distant corner of the room. The lamp should be held *out of the line of vision* 15 cm. from the eye to be tested. When the light is flashed on the pupil will contract.

*Reaction of the Pupil to Accommodation.*—The patient is requested to look alternately at the most distant object available and at the tip of the clinician's finger held 20 cm. from the eye which is being examined. When the farther object is sighted the pupil dilates.

**4th (Trochlear) Nerve** innervates only the superior oblique muscle. When paralysed, usually there is a slight deviation of the eyeball upwards and inwards,

but the striking symptom of which the patient complains is *diplopia* (Fig. 118), especially when going downstairs, i.e., *on looking downwards* (Rycroft).

**5th (Trigeminal) Nerve.**—See p. 97. A rapid test is to ask the patient to clench the teeth. The masseters can be felt to contract if the 5th nerve is intact.

**6th (Abducent) Nerve.**—Paralysis of the lateral rectus (Fig. 119).

**7th (Facial) Nerve.**—See p. 98. A rapid test is to ask the patient to show his teeth. Supra-orbital pressure (see p. 58), if it evokes a response on one side only in the unconscious patient, demonstrates facial paralysis.

**8th (Acoustic) Nerve.**—See p. 83.

**9th (Glossopharyngeal) Nerve.**—The principal sign of a lesion of this nerve is loss of taste in the posterior third of the tongue (see also p. 98).



Fig. 119.—Left sixth-nerve palsy following a head injury. The left eye does not follow an object laterally due to paralysis of the lateral rectus muscle.



Fig. 120.—Answer to the request 'Put out your tongue'. Case of paralysis of the left hypoglossal nerve.

**10th (Vagus) Nerve.**—Does the palate move when the patient says 'Ah'? The vagus innervates the soft palate and in unilateral lesions the uvula moves to the opposite side.

**11th (Spinal Accessory) Nerve.**—See p. 412. Paralysis of the trapezius leads to failure to shrug the shoulder.

**12th (Hypoglossal) Nerve.**—Ask the patient to protrude the tongue (Fig. 120).

#### FRACTURED BASE OF THE SKULL

A fracture of the vault, if not obvious clinically, almost always is seen on good quality radiographs. Diagnosis of the following is more difficult, for the fracture is often not visible on a radiograph.

**Fracture of the Anterior Cranial Fossa.**—One of the peculiar dangers of this injury is its liability to be internally compound by implication of one or more paranasal sinuses. In this event there develops cerebrospinal rhinorrhoea, with its ever-present possibility of meningitis. Another danger is that if the patient blows his nose or sneezes (which contingencies must be avoided by all means at one's disposal) air is likely to be driven into the cranial cavity beneath the dura, and a *pneumatocele* results. Cranial percussion over the frontal bone on the more involved side is then likely to give a sonorous note, but radiographs are necessary to confirm the diagnosis.

*The Differential Diagnosis between Orbital Haemorrhage consequent upon a Fractured Anterior Cranial Fossa and a 'Black Eye'.—*

1. Examine the eyelids. In a fracture the extravasated blood is limited to the orbital margin by the palpebral fascia and tends, therefore, to be circular. In 'black eye' there is no such limitation.

2. In fracture of the anterior cranial fossa the discoloration is purplish from the start, unlike the beefy redness of a recent 'black eye'.

3. Examine the conjunctiva. In 'black eye' there may be a conjunctival haemorrhage, but this is often *in* the conjunctiva (*Fig. 121*), and moves with the conjunctiva when the eyelid is moved gently by the pulp of the little finger. In fracture of the anterior cranial fossa the haemorrhage is always *subconjunctival*.



*Fig. 121.*—Conjunctival haemorrhage from injury.



*Fig. 122.*—Fracture of the right anterior cranial fossa. The bruising is limited by the orbital margin. A posterior limit of the subconjunctival haematoma cannot be found.

4. Ask the patient to rotate his eyes by following your finger. In 'black eye' the posterior limit of the extravasated blood can be defined. In a fractured anterior cranial fossa there is no posterior limit (*Fig. 122*), and the haemorrhage as a whole tends to be fan-shaped, the handle of the fan being towards the iris.

5. Two black eyes following one injury indicate fracture of the base of the skull (Finch) (*Fig. 123*).

**Fracture of the Middle Cranial Fossa.**—This should be suspected when there is blood, or blood diluted with cerebrospinal fluid, escaping from the auditory meatus, which must always be examined. The escape of blood, however, is not pathognomonic of a fracture, for it also occurs when the tympanic membrane is ruptured. However, with the latter the blood will clot, but blood admixed with cerebrospinal fluid will not but continues to drip. The exception to this rule is serious haemorrhage from tearing of the posterior branch of the middle meningeal artery.

Fractures of the middle cranial fossa may give rise to facial paralysis (*see p. 98*), and/or deafness, and/or nystagmus.

**Battle's Sign.**—If there has been doubt, bruising over the mastoid process appearing a day or two after the injury, confirms a diagnosis of fracture of the middle fossa.



*Fig. 123.*—Two black eyes following a fractured base of skull.

**Fracture of the Posterior Cranial Fossa** is even more menacing than fracture of the anterior or middle fossa, for one or more of the venous sinuses that groove the occipital bone are liable to be torn. Not infrequently deep coma persists from the moment of injury; soon the pupils become dilated and inactive. There is derangement of normal respiratory rhythm, culminating in Cheyne-Stokes (periodic) respiration (*Fig. 124*). In such cases, if the pulse becomes irregular it indicates a lesion of the brain-stem that will probably prove fatal.

Slowly developing clot accumulation leads to nystagmus and ataxia.



*Fig. 124.* A recording of Cheyne-Stokes respiration.

#### SIGNIFICANT SIGNS OCCURRING DURING THE PERIOD OF OBSERVATION OF A PATIENT WITH A HEAD INJURY

The clinician's aim is to decide which patients (a small minority) should be subjected to surgical intervention. In neurosurgical centres angiography and other sophisticated methods of diagnosis help in reaching a decision; in other circumstances any suspicion of traumatic intracranial haemorrhage should lead the surgeon to make exploratory bur-holes because to wait until clinical diagnosis is certain is to wait until the patient is near death. Traumatic intracranial haemorrhage, which may be extradural, subdural, or intracerebral, gives rise to acute cerebral compression which also can arise from cerebral oedema occurring around a major cerebral contusion or laceration.

**Pulse-rate.**—Gradual slowing—a sign to which much attention has been directed in classic descriptions of middle meningeal haemorrhage—prevails only when the increased intracranial tension so produced occurs very slowly. Much more commonly intracranial bleeding is accompanied by a fast pulse-rate.

**Temperature.**—Subnormal temperature due to shock from the blood-loss of associated injuries is common. As the shock is treated, a moderate pyrexia of up to 38° C. with fluctuations is usual and of no particular significance. It is due to aseptic absorption of small amounts of blood.

Pyrexia of 38° C. or over, developing a few hours after the accident, indicates primary injury to the thermoregulating mechanism, and usually other signs of a midbrain lesion (e.g., decerebrate rigidity) are present.

Considerable pyrexia developing at a later period, i.e., up to three days after the accident, is due, most probably, to an intracranial haematoma, or (especially in cases of a fractured anterior cranial fossa) to meningitis, or to other infection (e.g., pneumonia).

**Respiration.**—Rapid respiration associated with restlessness is a not infrequent accompaniment of intracranial haemorrhage. Stertorous breathing with the cheeks puffing in and out usually signifies an advanced stage of cerebral compression.

**Convulsive Seizures** occasionally are the first sign that something more serious than simple concussion is present. One may be fortunate enough to observe a



'fit', but rarely is the clinician so favoured: usually he has to trust to a description by the nurse. Try to find out where the fit *began*. In conjunction with the seeking of this information, it is useful to recall the localization of the various centres in the pre-Rolandic area (*Fig. 125*). In middle meningeal haemorrhage the fit is of the Jacksonian type\* and unilateral. In haemorrhage from the superior longitudinal sinus the fits may be bilateral.



*Fig. 125.*—Cerebral localization in the pre-Rolandic cortex.

Ordinary *epilepsy* (which may have caused the head injury, especially in children) may be the cause of difficulty. However, recovery is rapid and complete and usually the relatives know that the patient is an epileptic (Lewin).

**Neck Rigidity.**—Blood in the cerebrospinal fluid is an irritant and produces sterile meningitis. Therefore, if a patient, seen soon after the accident, is found to have slight pyrexia, a rapid pulse, and rigidity of the muscles of the neck, then, probably, subarachnoid haemorrhage is the correct diagnosis. It must however, be remembered that a fracture-dislocation of a cervical vertebra will also give rise to rigidity of the neck and a fast pulse-rate, but pyrexia is absent. In any case of doubt X-rays of the cervical spine must be obtained *before* testing for neck rigidity lest irreparable damage to the spinal cord be produced by the examination. To elicit the sign, proceed as follows: with the patient lying on his back in a relaxed state, the head is flexed steadily, but gently, on the thorax until definite voluntary resistance is felt. When the sign is positive, not only is the range of flexion distinctly subnormal, but when flexion is continued beyond the point where resistance is felt, it causes pain of varying intensity.

*Late neck rigidity* with high pyrexia and severe headache, particularly if associated with leakage of C.S.F. from the nose or an ear or following a compound fracture, should lead to a suspicion of septic meningitis.

**Lucid Interval.**—The classic sign of *middle meningeal* (syn. *extradural*) *haemorrhage* is a lucid interval. By this is meant that the patient regains consciousness

\* Jacksonian epilepsy = progression of involuntary clonic movements mainly limited to one side or to one group of muscles.

and shortly afterwards lapses once more into unconsciousness. It is subject to the widest variations, from a few minutes to several days, and may be completely absent because of (1) Severe concomitant injury of the brain, or (2) Alcoholism. Remember that a drunken person is particularly liable to injury and that the stupor can be due to alcoholic poisoning, or to head injury, or to a combination of these. The most serious difficulty, however, occurs when a patient remains unconscious because of intracerebral injury and yet an extradural haematoma is forming at the same time. In this instance the *extradural haematoma* can be suspected by (a) the presence of a haematoma of the temporalis muscle on the affected side; (b) the gradual onset of hemiparesis and hemiplegia; (c) deepening coma, perhaps accompanied by (d) Hutchinson's pupils (*see p. 65*).

*Subdural Haemorrhage* is very much more common than extradural, and is not usually associated with a lucid interval. However, like an extradural haematoma, lateralizing signs may be found to be present.

*Subarachnoid Haemorrhage* has been referred to above (*see Neck Rigidity, p. 63*). A neurological examination in such cases is often indefinite for any lateralizing sign.

*Intracerebral Haemorrhage* can be associated with either extra- or subdural haematoma, or it may be the sole lesion. Lateralizing signs are usually absent.

**Lateralizing Neurological Signs.**—A very characteristic feature of an extradural haematoma is the appearance of paralysis of the arm, leg, and face of the contralateral side. If the patient is completely conscious and co-operative (unusual),



*Fig. 126.*—Plantar reflex, extensor response—Babinski's sign (↑). The outer side of the sole from the heel forward is stroked with a blunt object. The big toe dorsiflexes and, typically, the other toes fan out.


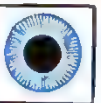






weakness or actual paralysis is easily ascertained. If a large extradural clot is present, on applying the supraorbital pressure test (*see Fig. 116*) the semiconscious individual will not respond on the affected side, but on the non-affected side purposeful movements will be made to remove the noxious stimulus. In the absence of signs of hemiplegia, the supraorbital pressure should be continued until the clinician is satisfied that movement takes place in all four limbs. When no response can be obtained to eliminate the possibility of the supraorbital nerves

being in bony grooves, and therefore incompressible, rub both cheeks vigorously, and then observe the face, particularly the corners of the mouth. Even in deep unconsciousness the corner of the mouth on the non-paralysed side tends to be drawn upwards after a 'facial massage'. When either of these tests suggests that hemiplegia is present, corroborating signs (absent abdominal reflexes, increased triceps jerks, and a positive Babinski's sign) must be sought. In comparatively early cases the arm is always more affected than the leg.

*Babinski's Sign* (Fig. 126) is most significant and (in cases of intracranial haemorrhage) the one present most frequently. It usually denotes a haematoma on the opposite side of the brain.

*Difficulty in Speech.* If the lesion is left-sided in a right-handed individual, the first lateralizing sign may be difficulty in speech (aphasia) if the patient is conscious; in right-handed people Broca's area usually is left-sided.

*Inequality of the Pupils* is of considerable localizing value. Hutchinson's pupil, due to compression of the third nerve against the free edge of the tentorium, is seen frequently in cases of extradural haematoma, but it occurs also in some cases of subdural haematoma. In order not to overlook this sign when it is of most value, half-hourly examinations of the pupils are mandatory. As a result of increasing pressure upon the third cranial nerve, the phenomenon of Hutchinson's pupil passes through the following stages:—

STAGE	PUPIL ON OPPOSITE SIDE TO THE LESION	PUPIL ON SIDE ON WHICH COMPRESSION COMMENCED	
1	Normal		 Slightly contracted. Reacts to light
2	Normal		 Moderately dilated. Reacts to light sluggishly
3	Moderately dilated. Reacts to light		 Widely dilated. Does not react to light
4	Widely dilated. Insensitive		 Widely dilated. Insensitive. Occasionally ptosis is present

The first stage is seen but rarely. It is the second (Fig. 127) and third stages that are of signal diagnostic importance.\* Widely dilated and fixed pupils on both sides indicate that death is near.

When any of the above signs, and especially when a combination of them, makes a diagnosis of serious intracranial lesion probable, it is most necessary to re-examine the shaved scalp to look for a haematoma or a bruise and to review the X-rays. Should the localizing signs point to a lesion on one side of the brain, and the haematoma or bruise is situated on the other, that is what we should

\* The *consensual* light reflex is lost in the Hutchinson pupil but is present with the fixed dilated pupil of intra-ocular haemorrhage or severed optic nerve, i.e., the pupil contracts when a light is shone into the opposite eye.

expect; but if the haematoma or bruise is situated on the same side as the paralysis, remember the possibility of a *contre-coup*\* injury.

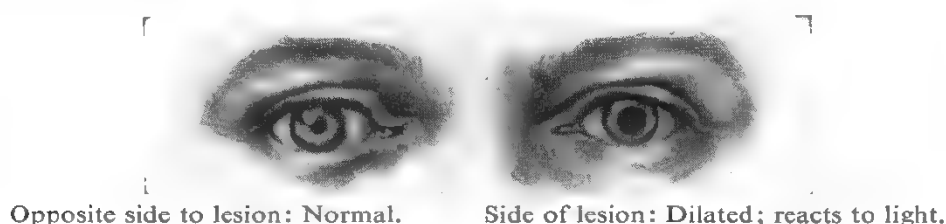


Fig. 127. Hutchinson's pupils: second stage.

**Cerebral Irritation** is almost certainly due to the presence of blood in the cerebrospinal fluid of a patient who is recovering consciousness. Usually it asserts itself about thirty or forty hours after the injury. The patient lies curled up in bed (Fig. 128), his face turned from the light, because he hates it (*photophobia*). The eye-

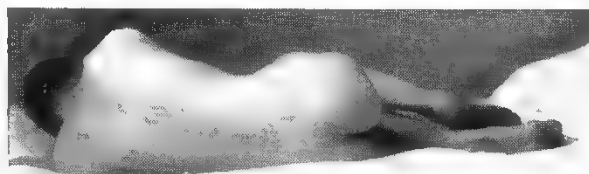


Fig. 128.—Cerebral irritation. The patient has turned away from the light.

lids are closed. The temperature is moderately raised. The patient resents being aroused. He is abusive and irritable. No further examination is necessary, or, indeed, possible.

#### TRAUMATIC INTRACRANIAL VASCULAR LESIONS

Blood-vessels may be damaged after a blow by being stretched or by impinging on an unyielding structure (e.g., the falx cerebri). Arteries may also thrombose subsequent to hypotension due to shock caused by extracranial injuries. The syndromes described below are commoner in older patients with brittle atherosclerotic arteries and are seen 2–5 days after the injury.

**Internal Carotid Artery Thrombosis.**—In a young patient a neck injury is the usual cause (see p. 397). Older patients are prone to such thrombosis with relatively minor trauma to the skull and no early loss of consciousness. In either instance the patient shows classic hemiplegia on the contralateral side with aphasia if the speech centre is on the affected side.

**Carotico-cavernous Fistula.**—See PROPTOSIS, p. 77.

**Venous Sinus Injury.**—One of the sinuses is torn by an extensive fracture easily seen on a radiograph. The site of the fracture is thus an important clue to localizing the bleeding sinus.

**Superior Sagittal Sinus.**—The slowly developing collection of clot causes bilateral leg spasticity with ankle clonus and extensor plantar reflexes but little or no involvement of the arms.

**Transverse (Lateral) Sinus.**—The collection of blood in the posterior fossa obstructs the circulation of C.S.F., causing bilateral papilloedema which is associated with diplopia due to sixth nerve palsy (see p. 60). The patient is otherwise well.

**Cavernous Sinus Thrombosis after Injury.**—The thrombus is aseptic and does not show the serious systemic illness or proptosis and chemosis of the septic variety (see p. 71). After an anterior cranial fossa injury (the fracture often not being seen on a radiograph) the patient develops delayed bilateral third-nerve palsy including ptosis (see p. 59).

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\* *Contre-coup*. French = counter-stroke. The transmission of a shock from the point struck to a point on the opposite side (of the head).

## BIRTH INJURY OF THE BRAIN

Diagnosis rests on suspicion when one or more of the predisposing factors are present. They are severe toxæmia of pregnancy, antepartum hæmorrhage, prematurity, foetal distress, difficult labour (often with forceps delivery), and precipitate labour.

**Traumatic Intracranial Hæmorrhage in Neonates** is by far the most frequent cause of death in the newborn, the hæmorrhage usually being subdural or subarachnoid. Convulsions are very common; usually they are generalized. The condition is said to be accompanied by the cephalic cry—a sharp, fretful cry, especially on picking up the child. Pyrexia or hyperpyrexia is a leading and important sign. Vomiting and failure to gain weight are frequent. The anterior fontanelle is tense and may bulge. Unilateral dilatation of the pupil is found in some cases.

Patients seen later, e.g., in childhood, often show spastic diplegia (*see* p. 450) as an end-result. In some a monoplegia or hemiplegia is found.

**Chronic Subdural Hæmatoma in Infants**, which is eminently suitable for treatment, has been overlooked because of the close simulation of the clinical picture with that of hydrocephalus (*see* p. 55). Often injury occurs during forceps delivery. The first sign is difficulty in feeding and irritability in an infant a few days old who has apparently recovered from one of the predisposing events mentioned above. Vomiting is frequent. The veins of the scalp are dilated, the anterior fontanelle bulges, and the child's head is enlarged but the eyes are not typically downcast.

## CHRONIC SPACE-OCCUPYING LESIONS WITHIN THE SKULL

Intracranial space-occupying lesions comprise not only neoplasms, but chronic hæmatomata (together with cysts arising therefrom) and abscesses. The general surgeon, in ordinary circumstances, is concerned only with such lesions as result from trauma or the septic complications thereof. If a rigid boundary is not drawn at this point it becomes extremely difficult to avoid a long digression into methods of diagnosis not strictly of surgical interest.

**Chronic Subdural Hæmatoma.**—This remote complication is of interest to the surgeon. Weeks or months after an injury a collection of blood draws fluid to it by osmosis, enlarges, and causes symptoms. Headache is usual and the patient becomes drowsy and confused. Lateralizing signs as with an acute extradural hæmatoma (*see* p. 64) may be present.

**Intracranial Abscess** is one variety of chronic space-occupying lesion. The practitioner should have some knowledge of the possibility of an abscess complicating certain surgical conditions.

Headache and vomiting are the major symptoms of an intracranial abscess, and papilloedema is a cardinal sign and should be sought with the ophthalmoscope. A description of the technique is beyond the scope of this work. The temperature is raised unless masked by antibiotics.

The three varieties described below may follow a compound injury in which event the problem of localization is simplified. In other circumstances the following considerations apply:—

**Extradural Abscess** is usually secondary to spread from the middle ear or from the frontal sinus. In the former the pus escapes into the extradural space through the tegmen tympani; in the latter through the posterior wall of the sinus. The signs are those of osteomyelitis localized to the bone affected. There is severe circumscribed headache, tenderness on percussion over the area involved, and in the case of the frontal region a Pott's puffy 'tumour' (*see* p. 56).

**Subdural Abscess** is produced by infected thrombophlebitis of the superior longitudinal venous sinus spreading from an infected frontal, ethmoidal, or



sphenoidal air sinus or other septic process in the head or neck. The abscess forms usually between the occipital lobe and the tentorium. The general signs of a serious infection usually are in evidence. Cortical thrombosis may cause Jacksonian epilepsy and paralyses as in extradural haemorrhage (*see* p. 63).

*Intracerebral Abscess* arises in one of several ways apart from trauma: (1) Otitis media with mastoiditis gives rise to an abscess of the temporal lobe or the cerebellum of the diseased side, the former being much more common. A chronic infection is more likely to result in a brain abscess than an acute infection. It is not unknown for a patient who has had a discharging ear for years to forget to mention it to his doctor. Too frequently, when he commences to vomit he is given medicine for indigestion and later, as this symptom progresses, he is ordered a barium meal. Only when he collapses and loses consciousness does it become obvious that a neurological examination should have been made earlier. The patient is suffering from an *otitic brain abscess*. (2) Nasal sinusitis with or without osteomyelitis may cause an abscess of the frontal lobe. (3) Lastly, and very important, is a *metastatic abscess*, a well-recognized complication of lung abscess, bronchiectasis, or pyaemic states. It can occur anywhere in the brain, and consequently its localization is usually a problem for the neurologist.

## CHAPTER VII

## THE ORBIT

DISEASES of the eye itself are beyond the scope of this work. In the surgical wards and out-patients are seen the results of trauma about the orbit and a variety of cystic and solid swellings many of which displace the eyeball forward. It is convenient to reserve the term 'proptosis' for these, and to retain the word 'exophthalmos' for the protrusion, bilateral or unilateral, associated with thyrotoxicosis.

Certain *congenital* lesions are drawn to the surgeon's attention.

**Epicanthus** is a congenital malformation in which there is a concave fold at the medial angle of the lids (*Fig. 129*), usually bilateral and present normally in Mongolian races. Its importance is that, when well marked, it gives an appearance mimicking squint, owing to the relatively larger amount of white sclerotic visible on the lateral, as compared with the medial, side. In some cases, as the nose develops the fold becomes less pronounced.



*Fig. 129.*—Epicanthus, left.



*Fig. 130.*—Buphthalmos (right eye).

**Coloboma.**—Notches, or colobomata, are sometimes present as congenital deformities of the lower lids. They are sometimes associated with dermoid cysts in the neighbourhood, and often form a part of the Collins-Franceschetti syndrome (*see p. 81*).

**Infantile Glaucoma (Buphthalmos).**\*—Generally both eyes are affected, and boys are attacked more often than girls. When increased intra-ocular tension develops in an infant, it causes uniform enlargement of the cornea and the sclera. This results in general enlargement of the eye so that it comes to resemble the eye of an ox. When the condition is chronic and unilateral (*Fig. 130*) the patient may present on account of some other condition, the affected eye being painless, though sightless or almost so. An investigation in blind schools shows that buphthalmos is the disease with the highest incidence—16 per cent (Douglas).

**Depressed Fracture of the Zygomatic Bone.**—Because of its prominence and exposed situation, the zygomatic (malar) bone is in a vulnerable position, and as a result of a blow upon it, inward displacement (*Fig. 131*), with shattering of the related wall of the maxillary sinus, is moderately common. This injury gives rise to a triad of signs: (1) Unilateral epistaxis (from tearing of the mucous membrane of the maxillary sinus); (2) A black eye with subconjunctival ecchymosis (from forcible displacement of part of the floor of the orbit); and (3) Flattening of the contour of the cheek in its upper part, a most telling but transitory sign, for within an hour or two the depression becomes masked by the bruising and oedema of the overlying soft tissues. Thus this depressed fracture is frequently overlooked at a time

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\* *Buphthalmos*. Greek, βούς: ὀφθαλμός = ox eye.

when it could be elevated with comparative ease and precision. Further delay is caused by arranging for a radiograph to be taken and by waiting for a radiological report, for it is not always easy for the inexperienced to see this fracture on a wet film. There is, however, a small series of additional physical signs that enable a prompt diagnosis to be made without such aid.



Fig. 131.—Depressed fracture of the zygomatic bone. The right pupil is a centimetre below the level of the left, and the margin of the lower lid and the inner canthus are depressed correspondingly.

1. With the pulp of the index finger, palpate the entire bony rim of the orbit in a circular fashion. If a depressed fracture of the zygomatic bone is present, a definite notch, or at least an unmistakable irregularity, will be felt on the inferior border of the orbital margin at the zygomatic suture line (Fig. 132). This is the sign *par excellence* of this fracture.

2. Often the upper lip is anaesthetic due to implication of the infra-orbital nerve at its exit from the infra-orbital foramen.

3. Diplopia from subsidence of the floor of the orbit.

4. Blood and clot within the maxillary sinus obliterate normal translucency. (See p. 137.)

**Orbital Blow-out Fracture.**—Blunt trauma to the orbit occasioned by blows by a fist or in car accidents cause compression of the orbital contents and disruption of the fragile orbital floor. Often the inferior oblique muscle is incarcerated in the fracture line, upward movement of the eyeball being lost. Those unaware of the entity are liable to diagnose an oculomotor palsy.



Fig. 132.—Depressed fracture of the zygomatic bone. Palpating the orbital rim.

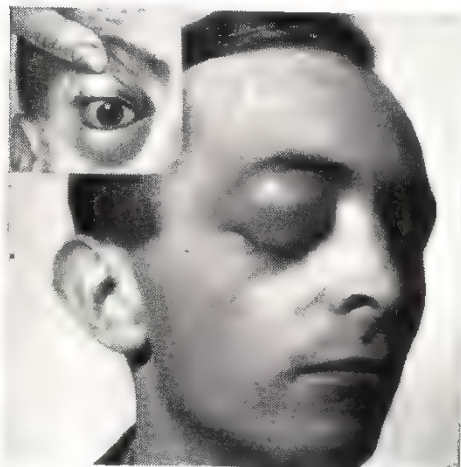


Fig. 133.—Orbital cellulitis. The patient cannot open the eye. Inset shows the accompanying proptosis.

**Black Eye.**—See p. 61.

**Orbital Cellulitis.**—In view of the fact that the paper-like lamina papyracea of the ethmoid forms the major part of the medial wall of the orbit, it is not surprising that the commonest cause is ethmoiditis. Others are infection from the frontal sinus,

a furuncle or other infection of the face, infection of a penetrating wound of the orbit, and, particularly in infants, infection from the gums and teeth. There is considerable swelling of the eyelids (*Fig. 133*). On parting the eyelids it will become apparent that there is a certain amount of proptosis and frequently chemosis\* as well. Because of pressure on, or involvement of, the optic nerve, often acuity of vision is reduced. There are two outstanding dangers of uncontrolled infection of this space—thrombosis of the cavernous sinus and infection of the globe of the eye.

**Thrombophlebitis of the Cavernous Sinus.** Infection reaches the sinus by various routes: (1) Along the angular and ophthalmic vein from infection of the face; (2) Along the lateral and petrosal venous sinuses from the middle ear; (3) Through the pterygoid venous plexus from infection of the pharyngomaxillary space (posterior variety of peritonsillar abscess; *see p. 131*); (4) From cellulitis of the orbit via the ophthalmic vein. The latent period between the appearance of the primary lesion and signs indicating involvement of the sinus is about five days. The onset is catastrophic with severe headache and rigors, followed by delirium and semi-consciousness. Oedema of the eyelids and chemosis are manifest early; to these are added proptosis, partial or complete ophthalmoplegia,† and finally dilatation and fixity of the pupil. Sometimes blood-stained tears trickle down the cheeks (*Fig. 134*). Unless checked by massive antibiotic therapy similar signs, varying from oedema of the eyelids to the fully fledged clinical picture, appear on the other side. Having regard to the free intercommunications of the cavernous sinus this tragic train of events with threat of blindness or death cannot be wondered at.



*Fig. 134.*—Thrombosis of the left cavernous sinus; right threatened. Blood-stained lacrimation.

### THE EYELIDS

**Blepharitis** is inflammation of the lid margins which are red with scales or crusts between the short and distorted lashes. It is often associated with errors of refraction or muscle balance, which must be investigated.

**Trachoma**‡ is a chronic inflammation resulting in the palpebral conjunctiva becoming studded with enlarged follicles (*Fig. 135*). As it advances the oedematous lids become partially ptosed, and epiphora is a frequent accompaniment.

**Ectropion** (eversion of the eyelids) can affect one or both lids. That due to senile degeneration of the orbicularis palpebrarum, or to long-standing severe facial paralysis affects only the lower lids. The eversion of the lower lid, leads to epiphora. (*Fig. 136* and *see p. 73*). Scarring such as that due to burns can cause ectropion on the following depending on its site.

**Entropion** (inversion of the lids) is a common complication of trachoma and of severe blepharitis.

**Xanthelasma Palpebrarum** are yellow, raised patches occurring on the skin of the upper eyelids near the inner canthus (*Fig. 137*). These plaques occur more

\* *Chemosis*. Greek, *χήμη* = cockleshell. Oedema of the ocular conjunctiva.

† *Ophthalmoplegia*: Paralysis of more than one of the extrinsic muscles of the eye.

‡ *Trachoma*. Greek, *τράχωμα* = rough.



frequently in patients with long-standing high blood-cholesterol levels and occasionally in a more generalized form, and are present typically on the extensor surfaces in the region of the elbows (*xanthomatosis*).



Fig. 135.—Trachoma.

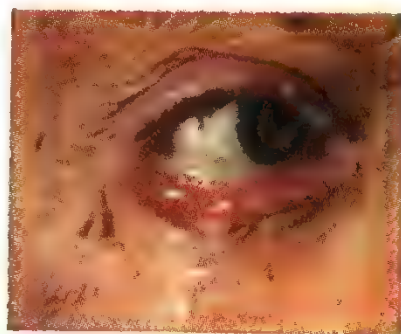


Fig. 136.—Ectropion.



Fig. 137.—Xanthelasma palpebrarum.



Fig. 138.—Hordeolum.

**Hordeolum\*** (stye) is a suppurative inflammation of one of Zeis's glands.† In the early stage the gland becomes swollen, hard, and painful. An abscess forms, which generally points near the base of one of the eyelashes (Fig. 138). The pain is considerable until the pus is evacuated. The condition is most common in young adults, but can occur at all times of life, especially in debilitated individuals.

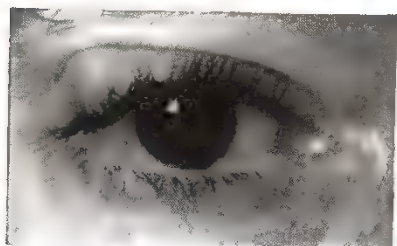


Fig. 139.—Chalazion.

**Chalazion,‡** often termed incorrectly 'Meibomian cyst', is a chronic granuloma of a Meibomian gland. Chalazia are more common in adults than in children, and are characterized by the formation of a swelling like a bead in the substance of the lid, usually tending to expand more towards the skin (Fig. 139) than towards the conjunctival surface. A small chalazion is difficult to perceive, but is readily appreciated by passing a finger over the skin of the lid. When the lid

is everted, the conjunctiva related to the swelling is dark red. When the affection occurs in the upper lid, blurred vision sometimes ensues, owing to distortion of the cornea produced by pressure of the swelling (temporary astigmatism). From time to time secondary infection occurs. The inflammatory symptoms are more violent

\* *Hordeolum*. Latin = a barleycorn.

† Zeis's glands = the ciliary glands = the sebaceous glands of the eyelids.

‡ *Chalazion*. Greek, *χάλασιον* = a hailstone.



than those of a hordeolum, for the gland is deeper and is embedded in dense fibrous tissue. Pus appears as a yellow spot shining through the conjunctiva—the so-called 'hordeolum interna'. It is exceptional for a suppurating chalazion to point cutaneously.

**Ptosis\*.**—*The Congenital Form* shows a very characteristic attitude of forced contraction of the frontalis, resulting in raising of the eyebrows and furrowing of the skin of the forehead (*Fig. 140*). Partial paralysis is masked by this means, but becomes manifest if the patient is asked to look upwards.

*The Acquired Form* is the result of paralysis of the third nerve (*see Fig. 4, p. 5*). If bilateral, myasthenia gravis (*see p. 90*) is the usual cause.

**Tumours of the Eyelid** are uncommon, with the exception of rodent ulcer (*see p. 36*).

### THE LACRIMAL APPARATUS

Enlargement of the lacrimal gland causes a swelling beneath the upper and outer part of the orbital rim, with bulging of the adjoining part of the upper eyelid. The fact that the swelling is below the eyebrow and that it extends into the orbit serves to distinguish it from an external angular dermoid (*see Fig. 155*).

**Dacryo-adenitis.**—The most common cause is ascending infection, nearly always staphylococcal, in which event the pre-auricular lymph-node is often enlarged. Other causes are: as a complication of mumps, or of glandular fever (search in the neck, axillae, and groins for enlargement of lymph-nodes, and examine the spleen for enlargement), or of herpes zoster of the lacrimal nerve.

**Neoplasms of the Lacrimal Gland.**—Morphologically the lacrimal glands are allied to the salivary glands, because in animals that retain a patent palatine foramen some of the tears drain into the mouth, supplementing the saliva. Pathologically the lacrimal gland shares with the salivary glands the changes peculiar to Mikulicz's disease (*see p. 105*), while, like that of the salivary glands, a neoplasm of the lacrimal gland (*Fig. 141*) often proves to be a mixed tumour.



*Fig. 141.*—Mixed tumour of the left lacrimal gland.

**Epiphora†** is due to acquired malposition of the puncta, obstruction of a lacrimal canaliculus, obstruction of the nasolacrimal duct, or dacryocystitis (*see p. 74*). Congenital obstruction of the nasolacrimal duct, consequent upon a septum or a valve in the lower end of the duct, is usually unilateral, and becomes evident about the eighth day of life. Infection of the lacrimal sac often supervenes, in which case the resulting overflow of semipurulent fluid is often mistaken for ophthalmia neonatorum. A fruitful source of epiphora is eversion of the lid from ectropion, which prevents the tears draining into the puncta. Partial epiphora



*Fig. 140.*—Partial congenital ptosis. The furrowed brow is characteristic.

\* *Ptosis*. Greek, πτώσις = a fall.

† *Epiphora*. Greek, ἐπιφορά = overflow of tears.

(the tear that never falls, *see Fig. 199*, p. 99) commonly occurs in facial palsy, and is due to sagging of the lower lid consequent upon paralysis of the orbicularis. As a result of the sagging, the punctum does not lie at the correct angle to allow the optimum drainage of the lacrimal secretion. Finally, it is possible for the nasolacrimal duct to be compressed by a neoplasm of the maxilla, although this is unusual.



*Fig. 142.*—Acute dacryocystitis (right).

**Dacryocystitis.**—*a. Acute Dacryocystitis* is manifest by pain, oedema, and redness of the skin overlying the lacrimal sac (*Fig. 142*). Epiphora is always present, and is of long standing if the acute episode follows chronic dacryocystitis. There is exquisite tenderness over the sac. Pus cannot be expressed through the punctum for two reasons: the pain on attempting to express pus is agonizing, and the more so because oedema shuts the canaliculus.

*b. Chronic Dacryocystitis.*—When the lacrimal sac is infected, usually there is some swelling over the site of the sac. Epiphora is a leading, and occasionally the only, symptom. Light pressure over the sac causes regurgitation of fluid—mucopus or pus—through the punctum. Conjunctivitis is a usual complication. In the recently born the condition must be distinguished from ophthalmia neonatorum; this is simple, for in chronic dacryocystitis, although there is a mucopurulent discharge, there is no inflammation of the conjunctiva.

#### THE ORBITAL SIGNS OF PRIMARY THYROTOXICOSIS (GRAVES' DISEASE)

It has been considered expedient to discuss the elicitation and interpretation of the orbital signs of thyrotoxicosis in this chapter rather than interrupt the continuity of the examination of the thyroid gland (Chapter XIV). 'Exophthalmos' is a disorder varying from staring eyes to obviously protruding eyeballs. Both eyes are not necessarily affected (*Fig. 143*) or, in a fair proportion of patients, are unequally affected. The globes themselves are not responsible; it is the related structures that suffer in the following sequence:—

**Mild Exophthalmos** consists merely of widening of the palpebral fissures due to retraction of the upper eyelids (*Stellwag's sign*,\* *Fig. 143*) consequent upon tonic contraction of the striated fibres of the levatores palpebrae superioris. This creates an illusion of bulging of the eye or eyes, corrected by:—

*Naffziger's Method of Examination.*—Stand behind the seated patient and tilt her head backwards, holding it in the manner shown in *Fig. 144*, which will keep the hair out of the way. Observe the eyeballs, your plane of vision being that of the superciliary ridges. By examining the globes in this manner it is possible to confirm (*Fig. 144*, inset) or eliminate the presence of protrusion of the eyeballs. Should this test eliminate actual protrusion, that this staring look is due to lid retraction can be confirmed by:—

*Von Graefe's Sign.*—The patient should be asked to follow the finger moved up

\* The names attached to this and the minor eye signs which follow are of academic importance only.

ROBERT J. GRAVES, 1796–1853, *Physician, Meath Hospital, Dublin.*

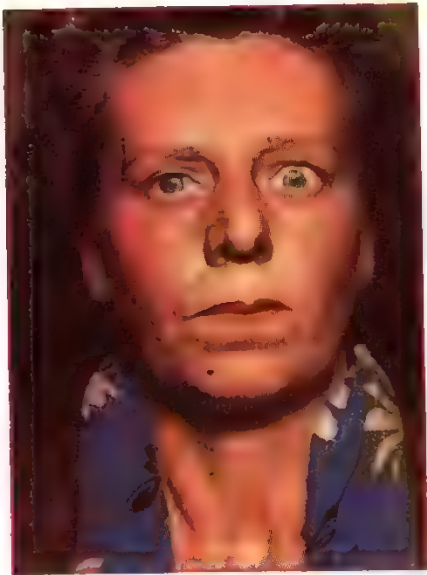
CARL STELLWAG VON CARION, 1823–1904, *Ophthalmologist, General Hospital, Vienna.*

HOWARD C. NAFFZIGER, *Contemporary Emeritus Surgeon, University of California, San Francisco.*

ALBRECHT VON GRAEFE, 1828–1870, *Professor of Ophthalmology, Berlin.*

and down several times, and not too slowly. Only persistent lagging of the upper lid (*Fig. 145*) behind the corneoscleral limbus should be taken as a positive result.

**Moderate Exophthalmos** (*Fig. 146*).—The bulging is due almost entirely to increased deposition of fat. On Naffziger's method of examination it is evident that



*Fig. 143.*—Unilateral exophthalmos showing lid retraction (Stellwag's sign).



*Fig. 144.*—Naffziger's method of looking for, or excluding, minor degrees of bulging of the globes.

eyes do, in fact, bulge. When the bulging has reached moderate proportions, *Joffroy's sign* is positive, namely an absence of wrinkling of the forehead when the head is bent down and the patient looks upwards (*Fig. 147*).

**Severe Exophthalmos.**—Intra-orbital oedema is superadded to the increased deposition of intra-orbital fat. Clinically it embraces three components:—



*Fig. 145.*—Von Graefe's sign. Upper lid lag when the patient looks down.



*Fig. 146.*—Moderately severe exophthalmos of a degree fairly typical of Graves' disease. Note the inequality of the bulging.

*a. Intra-orbital congestion* disclosed by watering of the eyes, especially in the early morning, at times misdiagnosed as conjunctivitis. This is the earliest manifestation which must be sought by examining the lateral ocular conjunctiva for dilated blood-vessels (*Fig. 148*).



*b. Increased resistance to light pressure on the globe, indicating raised intra-ocular tension, is found in varying degrees.*

*c. Muscular paresis (ophthalmoplegia), at times revealed by double vision. The eyes should be put through their full range of movement, upwards, downwards, inwards, and outwards, and inquiry made if any of them causes diplopia. Limitation of movement, especially in an upward and outward direction, is often noticeable. Later, difficulty in convergence (*Moebius's sign*, Fig. 149) becomes evident.*



Fig. 147.—Joffroy's sign.



Fig. 148.—Dilated conjunctival blood-vessels in a case of severe exophthalmos.



Fig. 149.—Moebius's sign. Difficulty in convergence when the patient is asked to look at a near object.

A small proportion of patients with severe exophthalmos also show pretibial myxoedema (*see p. 11*), a condition never found apart from Graves' disease with exophthalmos. Exophthalmos does not necessarily decrease after successful treatment of thyrotoxicosis; on the contrary, during the first nine months following such treatment, an average of 1 mm. more protuberance, as measured with an exophthalmometer, must be expected. After that time some slow recession occurs in the majority of patients. Nevertheless, the paradox obtains that in spite of slight further overfilling of the orbit there is subjective improvement in appearance due to release of spasm of the lids.

*The Differential Diagnosis between Unilateral Exophthalmos and Proptosis consequent upon an Intra-orbital Mass.*—If the upper eyelid cannot be everted, or is everted only with difficulty, the exophthalmos is more likely to be due to thyrotoxicosis, whereas if the lid is everted easily it is more likely that the displacement of the eyeball results from the presence of an intra-orbital mass (*Gifford's sign*).

**Progressive Exophthalmos** supervenes comparatively infrequently and usually after otherwise successful treatment of the thyrotoxicosis with which it was associated. As its name implies, if after treatment of the thyrotoxicosis (medical, surgical, or radiotherapeutic) the exophthalmos continues to increase instead of regress, it is categorized as having entered the progressive stage and visual acuity becomes impaired by one or more of the following complications:—

*Chemosis.*—The earliest manifestation is abnormal glistening of the conjunctiva which can be thrown into folds when pressure is applied to an eyelid while the patient is asked to look to one side. Later it is only too obvious (Fig. 150).

*Impairment of Corneal Sensitivity* is a danger signal—it is a herald of corneal ulceration and all the possible inflammatory disasters that this implies.

PAUL JULIUS MOEBIUS, 1853–1907, *Neurologist, Leipzig.*

HAROLD GIFFORD, 1858–1929, *Ophthalmologist and Otologist, Nebraska University, Omaha, Nebraska.*

*Exophthalmic Ophthalmoplegia.*—Paralysis, first of the muscles that elevate, and next of the muscles that abduct the globe, ensues. Usually the paralysis is asymmetrical and except in extreme cases the movements of adduction and depression of the globe are partially or completely preserved (Brain).



Fig. 150.—Progressive exophthalmos with pronounced chemosis.

### ENOPHTHALMOS

This is the opposite of exophthalmos, and it is encountered very infrequently. It is seen occasionally in cases of depressed fracture of the zygomatic bone or of the maxilla (p. 69).

### PROPTOSIS: ORBITAL SPACE-OCCUPYING LESIONS

Proptosis is the first sign and, depending on the situation of the swelling, the eye may also be displaced, usually downwards, or laterally, or downwards and laterally.

It should be noted that many space-occupying lesions of the orbit, diagnosed clinically as a neoplasm, later prove to be, not a neoplasm, but an example of one of the ill-understood granulomata.

**Primary Orbital Tumours.**—By careful palpation of the bony margins of the orbit (*see Fig. 132*) try to differentiate a swelling arising from the bone from that in the soft tissues of the orbit or in the globe itself.

*Glioma of the Optic Nerve* occurs as a rule in children between 4 and 15 years of age. There is increasing proptosis (*Fig. 151*), moderate restriction of the movements of the eye, and progressive visual disturbance. Unexplained scattered patches of pigmentation of the skin, especially of the trunk, are frequently present. This neoplasm can also arise in the optic chiasma, in which case the signs are identical, but bilateral.



Fig. 151.—Glioma of the optic nerve.

*Innocent Neoplasms* of the orbit—all of which give rise to proptosis—are a varied group, examples of which are an ivory osteoma (which usually arises from the roof of the orbit or the lacrimal bone), a dermoid cyst, and a cavernous haemangioma (*see Fig. 50*, p. 25).

*The Primary Malignant Tumours of the Orbit* are divided into extra-ocular and intra-ocular. Of the former, various forms of sarcoma are the most common.

The intra-ocular tumours, strictly, are outside our field, but it might be mentioned that the commonest, malignant melanoma (adults) and retinoblastoma (children) do not expand the globe until very advanced.



**Secondary Malignant Tumours of the Orbit.**—Unfortunately the majority of tumours of the orbit met with in general surgical practice are metastatic. In a child a neuroblastoma of the adrenal medulla (*Fig. 152*) gives rise to an orbital



*Fig. 152.*—Proptosis due to an orbital metastasis from a neuroblastoma of the adrenal medulla.

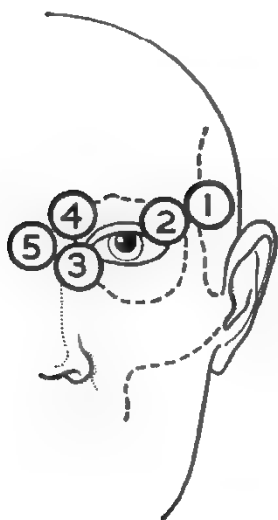


*Fig. 153.*—Secondary deposit in the orbit from a bronchial carcinoma.

metastasis relatively frequently, and in all cases of proptosis in a child, one of the first duties is to examine the abdomen. In the adult the discovery of an orbital metastasis (*Fig. 153*) should lead to an examination of the common primary sites mentioned on p. 435.

*Neoplasms of the Accessory Nasal Sinuses* (see p. 138) tend to displace the eye as well as cause proptosis in their later stages.

*Neoplasms of the Nasopharynx* (see p. 133) rarely present with proptosis, as this implies a very advanced stage.



#### CYSTIC SWELLINGS AROUND THE ORBIT

A number of localized swellings situated around the upper half of the rim of the orbit (*Fig. 154*) are to a great extent distinguished from one another by differences—in some instances very slight—in anatomical position.

*Fig. 154.*—The differential diagnosis of swellings situated around the rim of the orbit. 1, External angular dermoid; 2, swelling of lacrimal gland; 3, swelling of lacrimal sac; 4, mucocoele of frontal sinus; 5, internal angular dermoid.

**External Angular Dermoid.**—So constant is the position that it constitutes a clinical entity that can be diagnosed on sight, although it is necessary to confirm that the swelling is cystic. This sequestration dermoid, as its name implies, is situated over the external angular process of the frontal bone, which often is deeply hollowed to accommodate it. As a rule, the outer extremity of the eyebrow extends over some part of the swelling (*Fig. 155*). The latter typical feature serves to distinguish it from a swelling of the lacrimal gland.

**Internal Angular Dermoid** is much less common than the foregoing. As the cyst enlarges it usually comes to lie upon the root of the nose in a more or less central position (*Fig. 156*).

**Mucocele of the Frontal Sinus** is a result of blockage of the frontonasal duct. The mucocele causes a swelling similar in location, but on the medial aspect of the orbit (*Fig. 157*), to that caused on the lateral aspect by the enlargement of the lacrimal gland. As it enlarges, swelling displaces the globe.



*Fig. 155.*—External angular dermoid. The position is so constant that it allows of a 'spot' diagnosis.



*Fig. 156.*—Internal angular dermoid situated on the root of the nose.



*Fig. 157.*—Mucocele of the frontal sinus. The patient complained of double vision.

**Unilateral Pulsating Proptosis** is a rare condition that always arouses much clinical interest. When an eyeball pulsates synchronously with the pulse, the following possibilities exist:—

1. *Arteriovenous fistula* between the internal carotid artery and the cavernous sinus usually due to atherosclerosis but occasionally following a fractured skull. The pulsation ceases on occlusion of the carotid artery in the neck with digital pressure.
2. *Aneurysm of the ophthalmic artery.*
3. *Cirroid aneurysm of the orbit.* Dilated vessels are seen coursing over the orbital margins.
4. *Rapidly growing highly vascular orbital neoplasm.*

In the first three conditions the patient notices a buzzing noise in the head and diminution of acuity of vision in the affected eye.

## CHAPTER VIII

## THE EAR

**The Pinna.**—Those who indulge in detective literature are wont to believe that by scrutinizing the conformation of the pinna hereditary tendencies, criminal and otherwise, are revealed to gifted observers. Admittedly, the conformation of the pinna (Fig. 158) is interestingly varied, and close observation will enable the recognition of certain clinical entities to be described and illustrated.

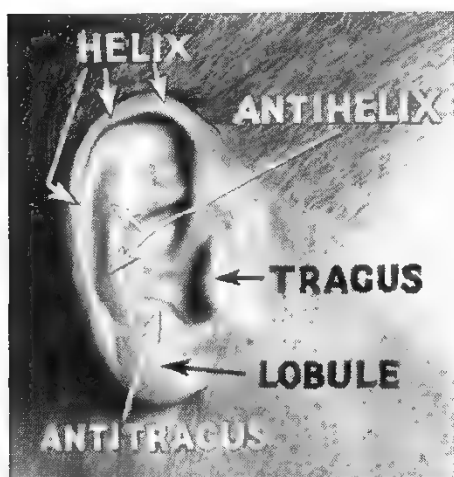


Fig. 158.—The main constituent parts of the pinna.

*An Accessory Auricle* is a protrusion from the posterolateral aspect of the face of a core of cartilage and fibrous tissue covered by normal skin. Diminutive examples are cylindrical and erect; most are polypoid and pendulous. The usual situation is close to the tragus (Fig. 159). There is little doubt that the origin is by sequestration of an island of cartilage from the mandibular arch during closure of the first branchial cleft. Thus the embryological derivation is identical with that of a cervical auricle save that the latter is associated, not with the first branchial cleft, but with a lower cleft.



Fig. 159.—Accessory auricle in a baby.

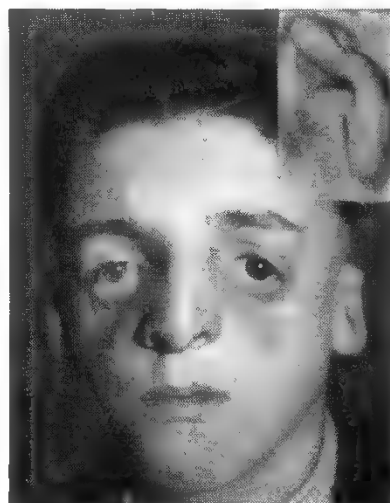


Fig. 160.—Malformation of the pinnae in a patient with the Collins-Franceschetti syndrome.

**Malformation of the Pinna.**—A great variety are encountered, ranging from over-development to absence. Between these extremes the pinna may be misshapened in almost every conceivable way depending upon absence, underdevelopment, over-development, or aberration in fusion of one or more of the six tubercles from which it

develops. Small, grossly misshapen ears are not infrequently associated with congenital atresia of the external auditory meatus, which results in deafness. Deformities of this kind are a regular feature of:

*The Collins-Franceschetti Syndrome* consists of congenital and familial deformities of the ears, not always bilateral, which tend not only to be placed lower than usual, but also the crumpled pinnae possess sound-catching convolutions facing in the opposite direction to normal, i.e., posteriorly (Fig. 160, inset). The palpebral fissures slope downwards and outwards. The lower eyelids are notched, and often without eyelashes. The upper lip is enlarged and the palate, if not cleft, is high. Micrognathia (see p. 88) is often present. The similarity between patients with this syndrome (Fig. 160) is striking, although their facial deformities vary in severity and in number. They are not mentally subnormal if the deafness is remedied early in life.

'Bat' Ears (Fig. 161) are, to put it mildly, self-evident.

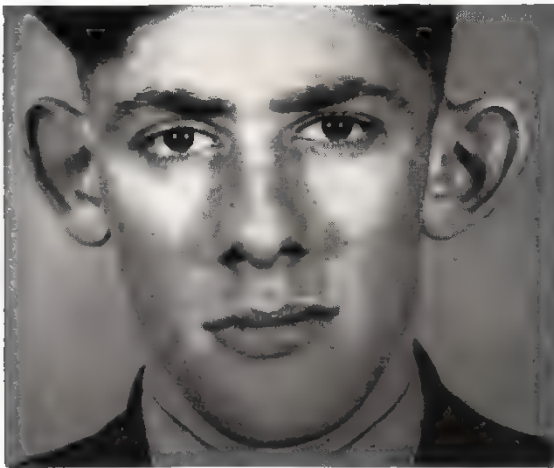


Fig. 161.—'Bat' ears. Fortunately, the deformity is remediable easily by a plastic operation.



Fig. 162.—Tophi. One in the sulcus between the helix and the antihelix has broken down.

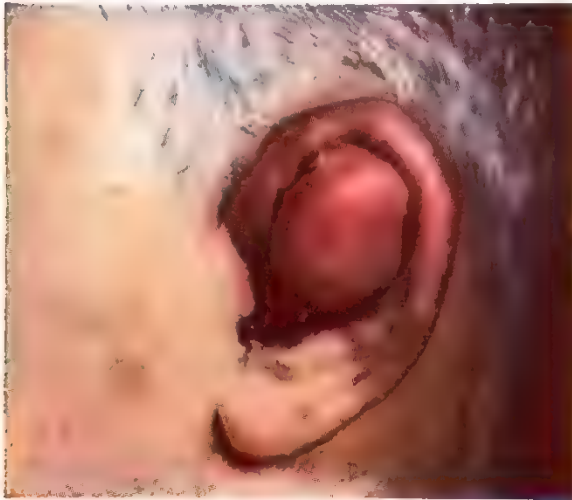


Fig. 163.—Haematoma auris.



Fig. 164.—Cauliflower ear in a pugilist.

*Tophi* are commonly present in long-standing cases of gout, and almost exclusively in males, their most typical situation being upon the helix or the antihelix (Fig. 162). They are also not uncommon in the olecranon bursa and in the



tendon-sheaths of the hands and feet. Occasionally one breaks down, ulcerates, and discharges chalky monosodium biurate.

*Haematoma Auris*.—Usually the result of injury (boxing, wrestling, and rugby football account for the majority), but occasionally occurring spontaneously (in which event a disease associated with a bleeding tendency should be suspected), haematoma auris is due to an accumulation of blood between the elastic cartilage of the auricle and its perichondrium. When seen soon after the accident, it presents as a tender, discoloured, doughy swelling of typical appearance (*Fig. 163*); pain is not a feature unless suppuration supervenes, but there is a feeling of weight and discomfort. Fluctuation is seldom present as the extravasated blood has clotted.

*A Cauliflower Ear* (*Fig. 164*) is an unsightly deformity resulting from repeated haematoma auris with consequent necrosis of the cartilage.

*Cyanosis and Frost-bite*.—The pinna is a good site at which to look for cyanosis (*see p. 47*). Owing to its relatively poor blood-supply, frost-bite, which is characterized by moderate swelling, redness, and the formation of vesicles which are later transformed into dark scabs, is frequent. Even after the scabs have separated, the skin continues to exfoliate for a long time. Initially painless, by the time scabs form there is a feeling of heat, interrupted by shooting pain, and later by itching which

causes the patient to scratch the part, thereby increasing the inflammation.

*Rodent Ulcer, Epithelioma* (*Fig. 165*), and *Molluscum Sebaceum* all occasionally involve the ear. These conditions are described on pp. 28 and 36.



*Fig. 165*.—Advanced carcinoma of the pinna.

**Lymphatic Drainage of the Pinna and the Auditory Canal.**—Lymph-node enlargement due to inflammatory or neoplastic disease may effect one or more of three groups (*Fig. 166*). The pre-auricular node shares with the ear the drainage of the side of the face, including the eyelid (*see p. 103*), while the remaining two depots filter the whole of the scalp and posterior triangle, as well as the pinna and the auditory canal.

**The External Auditory Meatus.**—Relatively few conditions can be diagnosed by observing the external auditory meatus, the use of a speculum being required to reveal most of the pathological states of the auditory canal and all of those involving the tympanic membrane. A consideration of the use of the auroscope is beyond the terms of reference of this work, but the student is exhorted to practise its use at every opportunity, for it is easily the most commonly used method of endoscopy in general practice.

*Furuncle of the External Auditory Meatus* causes intense pain, because the skin lining the canal is richly supplied with nerves, and it is densely adherent to the perichondrium without the intervention of subcutaneous tissue. Not infrequently the external auditory meatus is occluded by swelling, and hearing is impaired thereby. If such be the case, the pinna should be drawn very gently upwards and backwards; this causes pain, but the meatus will be opened by the traction, and as a result hearing will be restored. When the furuncle is situated on the posterior wall of the auditory canal, post-auricular oedema is likely to result and the pinna may be



displaced forwards, as in acute mastoiditis (*see* p. 85). Should the furuncle have burst recently, the pain will be lessened, and there will be a scanty, possibly blood-stained, discharge.

*Otitis Externa* is seen more frequently in hot damp conditions, hence its synonyms *Singapore* and *Hong Kong ear*. Itching is a feature, but pain is not marked. The skin of the external auditory canal and part of the pinna are macerated, boggy, and oedematous. As with furuncle, hearing is affected if the meatus is blocked and Valsalva's experiment (p. 84) will indicate a patent Eustachian tube.

*Aural Polypus*.—Chronic suppuration of the middle ear sometimes is associated with an aural polypus. Usually the polypus springs from the medial wall of the middle ear, and its stalk passes

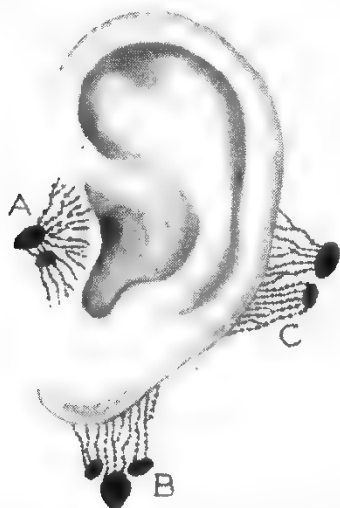


Fig. 166. —The lymphatic drainage of the pinna and the external auditory meatus. A, Pre-auricular; B, Superficial cervical; C, Post-auricular.



Fig. 167.—Aural polypus visible at the external auditory meatus. Inset, the attachment of the stalk of the polypus.

through the perforation in the tympanic membrane. When the stalk is of sufficient length (a rarity) the polypus is visible at the external auditory meatus (*Fig. 167*).

*Pre-auricular Abscess and Pre-auricular Ulcer*.—(*See* pp. 90–91.)

### THE MIDDLE EAR AND THE MASTOID ANTRUM

As noted above, examination with an auroscope is essential. It is useless to test hearing unless it is known that the auditory canal is free of wax.

**Examination of Hearing (Eighth Cranial Nerve).**—In every case of suppurative otitis media the middle ear will contain pus and debris. Consequently there will be some degree of deafness due to impaired *conduction* of sound, i.e., *middle-ear* deafness. *A fortiori* the same is true of acute mastoiditis. In Ear, Nose, and Throat clinics special apparatus should be available for measuring hearing. The practitioner proceeds as follows: -

The distance at which a watch normally can be heard in the particular conditions existing in the examination room at the time must be ascertained. It is assumed the clinician's ability to hear the ticking provides a rough normal. Stand behind the patient and note the distance at which the ticking of the watch can be heard on each side. Each ear is tested separately, one being occluded while the other is being tested. If an aural discharge is present, normal hearing suggests that the discharge is due to otitis externa or to a furuncle, rather than to otitis media.

**Rinne's Test.**—Place a vibrating tuning-fork\* on the mastoid process, with the limbs of the fork sloping backwards. The patient is instructed beforehand to signal when he no longer hears the sound. The still vibrating fork is then held close to the external auditory meatus. If the vibrations are still audible, then air conduction is better than bone conduction. This is the finding when hearing is normal, and in these circumstances Rinne's test is said to be *positive*.

If the vibrating tuning-fork applied to the mastoid process is heard *better* than when the tuning-fork, similarly vibrating, is placed close to the auditory meatus, then Rinne's test is said to be *negative*. Rinne's test is negative with *conductive deafness* when the transmission of sound through the ossicles in an air-filled tympanic cavity is rendered less good by inflammatory exudate, or is definitely interrupted by erosion of one or more of the ossicles by osteomyelitis, or by ankylosis of one or more of their joints by suppurative arthritis, or by fixation of the stapes as in otosclerosis.

In *perceptive deafness* due to a lesion of the internal ear or of the auditory nerve or in the brain, air conduction is better than bone conduction but both are defective (worse than the examiner's normal hearing of the tuning-fork), or may be completely lost.

**Weber's Test.**—Place a vibrating tuning-fork on the centre of the forehead. Normally the sound is appreciated by both ears equally, and if the patient occludes one auditory meatus with his finger the sound becomes louder on that side. Similarly, in unilateral middle-ear deafness the sound is lateralized to the affected side. If the sound is lateralized to the good ear, it suggests that the deafness in the affected ear is perceptive.

Giddiness, nystagmus, and nausea are signs of involvement of the labyrinth or the vestibular nerve, special tests (beyond the scope of this work) being necessary to confirm the integrity of these structures.

**Testing the Patency of the Eustachian Tubes; Valsalva's Experiment.**—Holding the nose so as to occlude the nostrils and blowing with the mouth shut causes air to pass up the Eustachian tubes and a crack is heard and/or a feeling of fullness is experienced in the ears.

Applying this 'experiment' as a test (applicable only when the patient is not in great pain or is not too young to understand what is required of him), ask the patient to pinch his nose, close his mouth, and blow, and to let you know (by a signal with the free hand) in which ear he feels 'something give' first. If a Eustachian tube is blocked, a point in favour of otitis media as it forms part of the middle-ear cleft, the crackle on that side will be absent.

### EXAMINATION OF A CASE OF SUSPECTED ACUTE MASTOIDITIS

Acute mastoiditis is a complication of otitis media. In a young child *acute* mastoiditis is the condition that must be suspected whereas in an adolescent or an adult *acute-on-chronic* mastoiditis is the usual contingency.

**Acute Mastoiditis in a Young Child.**—The mastoid region is tender in every case of acute otitis media during the first two or three days of the attack before rupture of the tympanic membrane, but it is exceptional for acute otitis media that has been treated *adequately* to give rise to acute mastoiditis. Only when pyrexia and mastoid

---

\* C256 (middle C).

tenderness appear in a patient with otorrhoea of several weeks' duration, and the discharge is increasing in amount, is it justifiable to attribute these findings to acute mastoiditis (Bauer). Another important consideration is that furuncle of the auditory meatus (a condition giving rise to symptoms and signs that in some respects simulate mastoiditis) is uncommon below the age of 10 years. These facts having been assimilated, the examination should proceed as follows:—

*In the first place* observe the patient from behind, and particularly note the angle of inclination the two pinnae make to the side of the head (*Fig. 168*). In untreated (by antibiotics) acute mastoiditis the pinna may be pushed forward—as it may be with a suppurating posterior auricular lymph-node. To exclude the latter (*a*) examine the scalp for an inflammatory lesion, not omitting a search for the presence of pediculi capitis (nits), and (*b*) palpate the posterior triangle of the neck for enlarged lymph-nodes (*see p. 54*).

*Secondly* (if the patient is old enough), test his or her hearing. In the case of a suppurating posterior auricular lymph-node hearing will be unimpaired. In acute mastoiditis, unquestionable *conductive* deafness will be present on the affected side.

*Thirdly*: If necessary armed with a swabstick, look for a discharge. If this contains obvious mucus, the source must be the middle ear because the auditory canal does not possess mucus-secreting glands. When the canal has been cleansed a perforation of the drum must be sought with the auroscope.

*Fourthly*, test for local tenderness. It is valueless to seek local tenderness over the mastoid process because, as has been explained, tenderness is present in this situation both in otitis media and post-auricular adenitis. On the other hand, tenderness (after the first few days) elicited when pressure is applied over the suprameatal triangle of Macewen, which overlies the mastoid antrum, is of crucial importance, and, unless the sign is positive, a diagnosis of acute mastoiditis is not substantiated. Except in the very young, this triangular depression can be felt through the skin (*a*) by drawing the pinna forward (*Fig. 169*), which gives access to all but the anterior limit of the triangle, and (*b*) by direct finger-pressure (*Fig. 170*), which enables the anterior limit to be felt more readily than the posterior edge of the triangle. If the first, and then the second, method is employed no stone will be left unturned to ensure that the area of tenderness is localized accurately. When acute mastoiditis develops in a fully cellular mastoid process, pus may burrow to the surface and form a subperiosteal abscess, which causes forward displacement of the pinna, described already. Rarely, the pus tracks into the digastric fossa, forming an abscess over and beneath the tip of the mastoid process (Bezold's mastoiditis), in which case fluctuation may be detected at this point.

**Acute-on-Chronic Mastoiditis.**—Chronic mastoiditis is painless and causes a long-continued discharge via a perforated drum and conduction deafness (almost



*Fig. 168.*—Examination from the back in mastoiditis. Note that the ear on the affected side stands out.

always). Its diagnosis depends on X-ray changes and need not concern us here. Should the free drainage of pus from the mastoid antrum and the middle ear become impeded by granulation tissue blocking the perforation in the tympanic membrane, or by the enlargement of a cholesteatoma\* occluding the aditus† retention of pus under pressure ensues, and acute-on-chronic mastoiditis is at hand, the first and foremost symptom of which is severe pain in the ear. The first sign is *lessening or cessation* of the aural discharge that has been present for a very long time—in all probability for years.



Fig. 169.—Testing for tenderness over the mastoid antrum. Method *a*.



Fig. 170.—Testing for a point of tenderness over the mastoid antrum. Method *b*.

The condition for which acute-on-chronic mastoiditis is most likely to be mistaken is a furuncle situated on the posterior wall of the auditory canal. A furuncle in this situation will cause very severe pain similar to that of mastoiditis, as well as narrowing of the external auditory meatus, and possibly some forward displacement of the pinna due to posterior extension of inflammatory oedema. In usual circumstances a patient with a furuncle of the auditory canal will not give a history of long-standing aural discharge; indeed, as a rule, while the pain is acute there is no discharge at all (*see* p. 82).

It is, however, possible for a furuncle of the auditory canal to occur in a patient with chronic mastoiditis, in which event, difficulties in differential diagnosis deepen. Nevertheless, with this coincidence it is improbable that the narrowing of the external auditory meatus will prove sufficient to cause the aural discharge from which the patient has suffered for years to lessen in amount or alter in consistency.

**Traction on the Pinna.**—The crux in the differential diagnosis between these two conditions rests in gentle upward and backward retraction of the pinna. In furuncle, this sign induces such intense pain that the examiner instinctively ceases

\* Cholesteatoma. A pearly or putty-like mass of epithelium desquamated from the infected attic or antrum + cholesterol crystal. Particularly the soft variety smells abominably.

† The narrow passage leading from the mastoid antrum to the tympanic cavity.

to complete the retraction: in acute-on-chronic mastoiditis little or no pain is evoked.

**Complications.**—The usual channel for its escape being blocked, pus locked within the mastoid antrum, by a process of pressure necrosis, seeks, and not infrequently gains, an exit in one of several ways:—

*a.* Through the tegmen (roof) = extradural abscess; subdural abscess; meningitis.

*b.* Through the posterior wall = thrombophlebitis of the lateral sinus.

*c.* Through the medial wall = labyrinthitis.

**Thrombophlebitis of the Sigmoid (Lateral) Sinus.**—The sinus lying behind and below the mastoid antrum can be implicated by the spread of thrombophlebitis from small veins of the tympanic cavity, or by juxtaposition of an extradural abscess. The classical signs in the pre-antibiotic era were a hectic temperature rising to 39° or 40° C., followed by rigors and profuse sweating, with comparative well-being in the intervals. This no longer appertains today. As a result of antibiotic therapy there is only a moderate rise in temperature. However, sometimes tenderness along the course of the internal jugular vein can be elicited, and occasionally induration can be felt. Torticollis (*see* p. 139) is also a significant sign.

**Facial Nerve Paralysis** (*see* p. 98), occurring in association with otitis media either acute or chronic and whether complicated by mastoiditis or not, is a sign that treatment is inadequate and should be reviewed. It is due to the proximity of the nerve, in its bony canal, to the middle ear.

**Zygomatic Mastoiditis** occurs when air cells exist in the zygomatic process of the temporal bone and become infected. An inflammatory swelling in front of and above the ear may simulate parotitis, but the other signs of acute-on-chronic mastoiditis are present.

**Gradenigo's Syndrome** consists of signs of acute-on-chronic mastoiditis associated with homolateral paralysis of the sixth cranial nerve (*see* p. 60) and deep-seated retro-orbital pain. The abducent nerve leaves the posterior cranial fossa in a narrow sheath of dura mater and becomes compressed when air cells in the tip of the petrous apex become inflamed.

**Middle Ear Carcinoma** occurs as a complication of long-standing chronic mastoiditis and is rare. If a patient with an aural discharge of many years duration continues to complain of pain when there is no evidence of acute-on-chronic mastoiditis the condition should be suspected.



## CHAPTER IX

## THE FACE AND JAWS

## SOME CHARACTERISTIC FACIES

THE study of characteristic facies is always of profound interest and importance. Here will be described some facies of surgical interest not illustrated in other sections of the book.

**The Hippocratic Facies.**—The eyes are sunken, but bright. The nose is pinched. There are crusts on the lips. The tongue is dry and shrivelled. The forehead is cold and clammy. It is true that the sharp nose, hollow eyes, and collapsed temples



Fig. 171. — Hippocratic facies. Advanced peritonitis.



Fig. 172. — Micrognathia. The profile should enable a prompt diagnosis, imperative if the infant's life is to be preserved.

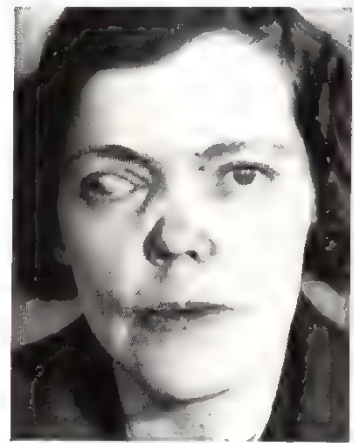


Fig. 173. — Facies of congenital syphilis. Saddle-nose and scar of interstitial keratitis.

are due mainly to the result of dehydration rather than of peritonitis as such, but this facial picture (Fig. 171), combined with a thready pulse and a grossly distended abdomen, is pathognomonic of advanced diffuse peritonitis.

**Micrognathia (Pierre Robin Syndrome).**—The neonate has a characteristic profile (Fig. 172) due to a foreshortened horizontal ramus of the mandible. This renders the tongue unduly mobile and results in tongue swallowing with frequent attacks of dyspnoea and cyanosis especially if a cleft palate is also present, as is usually the case. Another neonatal rarity which can only be diagnosed from previous knowledge of the typical syndrome is *nasal choanal atresia*. The infant becomes cyanosed whenever it stops crying at which time it instinctively tries to breathe through its (blocked) nose. An attempt to pass a fine rubber catheter down both nostrils proves that they are blocked posteriorly at the choanae. Choking and cyanosis on feeding is also seen as the baby cannot mouth-breathe when feeding.

**The Facies of Congenital Syphilis.**—Both congenital and acquired syphilis can produce a saddle-shaped nose, but one must not hastily conclude that snub noses are necessarily the result of syphilis. Nevertheless, a sunken bridge of the nose (Fig. 173) does call for more than a casual glance for other stigmata. Thus should there be associated bossing of the frontal bones, interstitial keratitis (or the scars

HIPPOCRATES, by common consent the Father of Medicine, was born in the Island of Cos in the Aegean Archipelago about 360 B.C. He lived to be over 80 years of age in an era when the average expectation of life was approximately 32 years.

PIERRE ROBIN, 1867–1950, Stomatologist to the Hospitals of Paris.

thereof), Hutchinson's teeth (*see* p. 115), or deafness, that is reasonable evidence of syphilis. Hutchinson's triad of congenital syphilis consists of the last three.

**The Facies of Cretinism** in infancy is easily overlooked. The face is pale, puffy, and somewhat wrinkled. The skin is dry and cold. A protruding tongue (*Fig. 174*) is especially characteristic. The anterior fontanelle remains open. In endemic cretinism the thyroid gland is palpable, if not visibly enlarged; in the sporadic variety, usually but not invariably, the atrophic thyroid is impalpable.



*Fig. 174.*—Facies of a cretin. The large protruding tongue is characteristic.



*Fig. 175.*—So-called 'adenoid' facies.



*Fig. 176.*—The facies of hepatic cirrhosis. Note several spider naevi on the cheek.



*Fig. 177.*—Virile facies in a woman, aged 25, suffering from adrenocortical hyperplasia.



*Fig. 178.*—Moon face of Cushing's syndrome in a female patient aged 19.



*Fig. 179.*—Facies of myasthenia gravis. The ptosis and drooping jaw are intermittent.

**'Adenoid' Facies.**—The concept that enlarged adenoids are the cause of a high-vaulted palate, narrow dental arch, and protruding incisor teeth (*Fig. 175*) has been abandoned (Gwynne-Evans). This triad of defects is familial. Enlarged adenoids, however, may be coincidentally present so the patient merits a full examination of the nasopharynx (*see* p. 131).

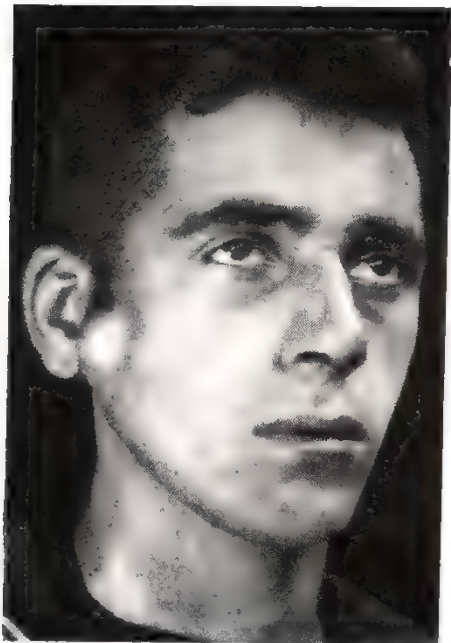
**The Facies of Hepatic Cirrhosis** (*Fig. 176*).—When the disease is moderately advanced the eyes are sunken, and a variable degree of icterus is present in the watery conjunctivae. The presence of spider naevi (*see* p. 241) contributes to the suspicion that the function of the liver is impaired by cirrhosis.



The **Virile Facies** of a woman suffering from hyperplasia or tumour of the adrenal cortex is often so evident (*Fig. 177*) that further description is superfluous.

**The Moon Face of Cushing's Syndrome** (*see p. 48*).—The face becomes rubicund, rounded like a full moon (*Fig. 178*), and often the lips are pursed.

**Myasthenia Gravis**, due to dysfunction of the thymus, and sometimes to a neoplasm thereof, is characterized by abnormally rapid exhaustion of muscles, particularly of the face. Whatever the muscular movement involved, after a rest there must be a return to power, at least in part, for the diagnosis to be made. A number of patients with this affliction have signs referable to the eyes (*Fig. 179*). Particularly characteristic is intermittent ptosis, unilateral or bilateral. When this is combined with a drooping jaw, the appearance produced should bring myasthenia gravis to mind. Another earlier, more common, but less striking facies produced by this disease is the sneering smile consequent upon deficient action of the risorius and zygomatici muscles.



*Fig. 180.*—Chronic abscess connected with an infected lymph-node. The latter proved to be tuberculous.

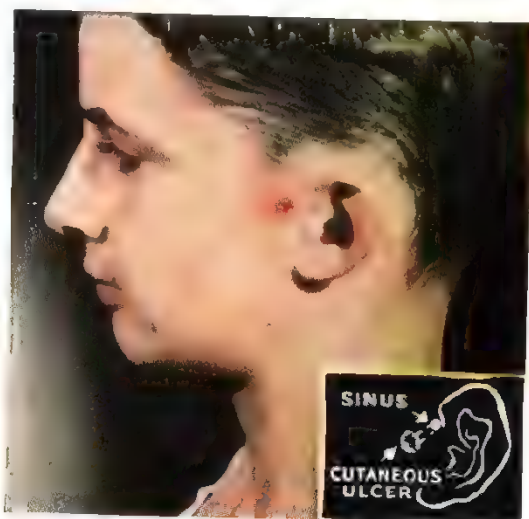
Having decided that the swelling in question is an abscess, recall that the pre-auricular lymph-node drains the side of the face, the pinna, and the anterior wall of the external auditory meatus (*see Fig 208*, p. 103). Scrutinize these regions with care, not forgetting the eyebrow and the eyelids of the corresponding side, and inquire whether the patient has had earache or an aural discharge recently. However,

### THE CHEEK

**Pre-auricular Abscess.**—The most common cause of a pre-auricular abscess, whether it be acute or chronic (*Fig. 180*), is suppuration within, and breaking down of, a pre-auricular lymph-node.



*Fig. 181.*—Acute pre-auricular abscess due to infection of a congenital pre auricular sinus.



*Fig. 182.*—Pre-auricular ulcer in an 8-year-old boy present for several years. Referred as a tuberculous sinus.

there is another cause of pre-auricular abscess, and particularly of a recurrent pre-auricular abscess, namely a *congenital pre-auricular sinus*—an abnormality due to imperfect fusion of the six tubercles from which the pinna is developed. Therefore, in every case where a primary focus of infection cannot be found, attention should be directed to the root of the helix where in cases of pre-auricular sinus a tiny pit can be seen (*Fig. 181*). Less often it is situated on the tragus (*Fig. 181, inset*).

**Pre-auricular Ulcer** (*Fig. 182*) is a late stage of an abscess due to a congenital pre-auricular sinus. It refuses to heal, for infection is maintained from the sinus (Stammers). Ignorance of the condition leads to a diagnosis of tuberculosis.

**Accidental Vaccinia** (*Fig. 183*).—One of the ways in which the contagion occurs is as follows. The recently vaccinated child with a cutaneous lesion on its arm in full activity, while being carried by its mother, impinges the vaccinated area against her cheek (*Fig. 183, inset*). When the scab darkens, it may be mistaken for anthrax (*see Fig. 69, p. 31*).

#### Method of examining a Localized Swelling in the Cheek.—

1. Observe the outside of the cheek, and decide whether the swelling in question is situated in the skin.

2. Observe the buccal aspect, and satisfy yourself whether the swelling originates in the buccal mucosa.

3. Palpate between the finger in the mouth and thumb outside.

In the case of a swelling not in the skin and not in the mucosa, remember the sucking pad of the infant which sometimes persists. There is also an inconstant lymph-node along the course of the facial artery (*see Fig. 216, p. 107*).

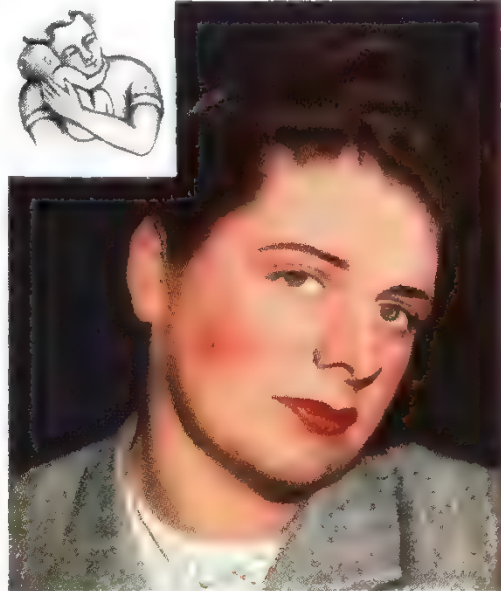
Further details of examining the mucous surface of the cheek are given on p. 127, those for examining Stensen's duct on pp. 101, 103.

**Idiopathic Hypertrophy of the Masseter Muscle** can occur on one or both sides. Ask the patient to close his mouth and clench his teeth—the whole of the swelling hardens beneath the fingers. Request him to stop clenching—the whole of the swelling softens. Only a muscle could fulfil these responses in their entirety.

### THE TEMPOROMANDIBULAR JOINT

**Routine Examination of the Joint.**—The normal jaw can be opened to the extent that there is a distance of 2–5 cm. between the incisor teeth, depending on age and sex. Place the fingers over the joint while the patient opens and closes his mouth; note if there is any crepitus or clicking. Crepitus signifies osteo-arthritis, and clicking suggests a loose meniscus. Auscultation over the joint may reveal significant crepitus and comparison with the side not complained of may yield more valuable information than the fingers can provide. Observe whether dental mal-occlusion\* is present.

\* Normally the upper incisor teeth lie in front of the lower when the jaw is closed. If the upper jaw is displaced backwards this relationship is lost.



*Fig. 183.*—Accidental vaccinia. Inset, the commonest way in which inoculation takes place.

**Trismus.\***—The patient cannot open his mouth because of muscular spasm. Severe trismus may complicate any inflammatory process in the neighbourhood of the mandibular joint. Chief among these is an erupting third mandibular molar (wisdom) tooth or a dental abscess. Insert a spatula gently along the buccal aspect of the cheek, and inspect the alveolus with an electric torch.

Trismus is also seen in tetanus. The contraction of the musculature about the jaw gives the patient a painful smiling appearance—the *risus sardonicus* (Fig. 184)—helpful in the diagnosis of early cases.



Fig. 184.—The risus sardonicus of tetanus.

**Displaced Articular Cartilage** of the temporomandibular joint presents in one of two ways:—

**Clicking Jaw:** On the first occasion the patient, usually a female, hears something 'snap in the ear'; subsequently, almost every time she opens her mouth she hears a click. Not unnaturally, this gets on her nerves and, on account of the phenomenon, some patients become introspective and even hypochondriacal. Occasionally the click is audible by others, for instance at the dining table.

**Locking:** Occasional attacks of locking occur without, or more usually with, clicking. There is sudden pain in the joint, which soon radiates to the pinna and to the skin above it, and here the pain remains located until the cartilage is reduced, or reduces itself. The patient usually is unable to close the mouth completely. The attacks are often accompanied by excessive salivation.

**Dislocation** of the temporomandibular joint can be either bilateral or unilateral; the former is more common, and in some cases it becomes habitual (Fig. 185). Those cases due to dental extraction are, for the most part, unilateral.

Normally, every time the mouth is opened over a centimetre the head of the mandible leaves its socket. When the restraining ligaments are loose or broken, true dislocation occurs by the head of the mandible passing over the articular eminence.

**Bilateral Dislocation.**—When the dislocation is bilateral the prognathous† deformity is so evident as to attract attention immediately. The mouth is open and fixed, with the lower teeth protruding. Upon examination of the mandibular joints, a distinct hollow will be seen and felt in front of the tragus.

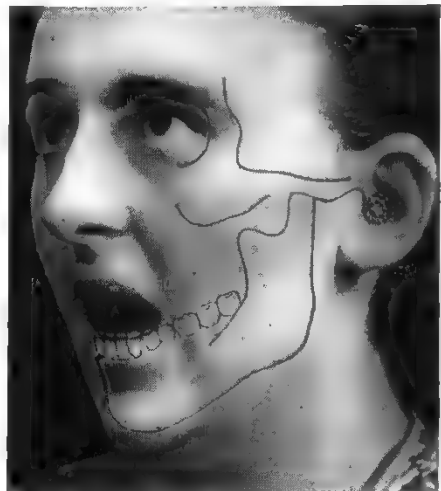


Fig. 185.—Case of recurrent dislocation of the jaw. Every time the patient yawned, and sometimes when she ate, dislocation occurred.

\* *Trismus*. Greek, τρισμός = clenching.

† *Prognathous*. Greek, πρό in front of, + γνάθος jaw = having a projecting jaw.



**Unilateral Dislocation.**—The partially open jaw is deviated to the opposite side and the small hollow noted above may be felt behind the dislocated condyle.

**Ankylosis of the Mandibular Joint.**—Opening the mouth is restricted to a lesser or greater degree. In old-standing cases, incurred during infancy, the lower jaw atrophies (*Fig. 186*). The receding chin gives a characteristic 'shrewmouse' profile (Dufourmentel).



*Fig. 186.*—The 'shrewmouse' profile.



*Fig. 187.*—Extreme swelling soon after a severe fracture of the upper jaw. The bandage supports a fractured lower jaw.

Unilateral ankylosis arising later in life is not recognized so easily, and when the ankylosis is fibrous, it cannot be demonstrated by radiography. In cases of some standing, when the face at rest is viewed from in front, the facial furrows are more evident on the healthy side (Murphy). The condition should not be confused with facial paralysis (Kennon). Attempts to open the mouth are associated with a slight but definite deviation of the lower incisor teeth towards the ankylosed joint.

### THE MAXILLA

**Fractures of the Maxilla.**—Fracture of the zygoma is dealt with on p. 69. Other fractures of the upper facial skeleton all involve the maxilla and, if suspected, examination of the surfaces of the maxilla mentioned below will prove rewarding. Remember, however, that after an hour or two oedema will mask deformity (*Fig. 187*) except in those severe fractures in which one or both maxillae have been markedly displaced backwards in relation to the rest of the facial skeleton ('dish-face'). Always look for a break in the continuity of the upper alveolar margin and, if the patient is not edentulous, for malocclusion of the teeth.

**Examination of the Maxilla.**—The anterolateral surface is the one most obviously available for examination, but we must go further and remember that the maxilla has five surfaces.

1. *The posterior surface* can be dismissed at once, forming as it does the anterior boundary of that deep recess, the pterygopalatine fossa, no part of the body being more completely beyond the reach of clinical methods.

2. *The superior surface* helps to form the floor of the orbit; therefore the levels of the inferior orbital margins are compared carefully. Extreme upward bulging of the floor of the orbit causes proptosis (*Fig. 188*), which in turn results in diplopia.

A glance at each profile of the patient is taken in order that the relative protuberance of the eyeballs can be compared.

3. *The antero-external surface* is palpated. While this is in progress, note if there is any sign of overflow of tears (epiphora) on the affected side, and question the patient about this. The nasolacrimal duct may become involved in malignant disease of the maxilla.



Fig. 188.—Malignant upper jaw. In addition to expanding the antero-external surface of the maxilla slightly, the growth has displaced the orbital contents. Depression of the angle of the mouth on the affected side is also a typical sign (Wilson).



Fig. 189.—Examining the upper jaw. The inferior surface of the maxilla is the hard palate. In this case of carcinoma of the maxillary sinus the corresponding side of the hard palate was involved, and the nostril was blocked.

4. Much of the upper jaw is available for examination through the mouth.

a. Examine the teeth and compare the dental formulae; missing teeth must be accounted for—careful attention to this may elucidate the diagnosis, e.g., in odontomata.



Fig. 190.—Examining the buccal aspect of the upper jaw. Case of cyst of the maxilla, presumably of dental origin.

b. *The inferior surface* of the maxilla forms the major part of the hard palate. In certain cases of malignant upper jaw, the swelling can be seen (Fig. 189).

c. A large part of the *anterior surface* is beneath the cheek, and without the intervention of the cheek (Fig. 190) much more can be made out than by external palpation. Pass the index finger between the cheek and the jaw. With the thumb outside, and the finger still inside, the zygomatic process should be palpated.

5. *The medial surface* forms the lateral wall of the nostril, and by occluding the nares one at a time and asking the patient to blow through the nose, some rough idea of this surface may be obtained. If the

nostril on the affected side is *not* blocked, we know at least that the medial wall of the maxilla is not bulging to any great extent. Sometimes bulging is apparent on inspection (*see Fig. 189*). Should there be unilateral nasal obstruction, a nasal speculum must be used to investigate the cause.

Finally, examine the cervical lymph-nodes, and also test the integrity of the second division of the fifth cranial nerve (p. 97).

Ordinary clinical examination of the upper jaw can be supplemented by transillumination of the maxillary sinus (*see p. 137*). This readily available method may yield valuable information, but it is less reliable than radiography.



*Fig. 191.*—Acute osteomyelitis of the right maxilla in a newborn baby.



*Fig. 192.*—An example of Burkitt's tumour.

**Acute Osteomyelitis of the Maxilla in Infants.**—The baby is severely ill with high pyrexia. The first sign is the appearance of redness and swelling below the inner canthus. At this time the differential diagnosis from dacryocystitis and from orbital cellulitis is difficult. The upper and lower eyelids soon become puffy (*Fig. 191*) and there is a discharge of pus from the nostril on the affected side. Unless the infection can be arrested, it progresses subperiosteally and in a matter of about 48 hours the inflammation reaches the alveolar margin where swelling can be seen.

**Burkitt's Tumour (Burkitt's Lymphoma).**—In many parts of tropical Africa this is easily the commonest neoplasm between 4 and 8 years of age and exceeds all others combined in this age-group. The sex incidence is roughly equal and it is found in a wide belt thus on either side of the Equator. —>

In 80 per cent of cases a tumour of the jaw is the first manifestation, the maxilla being involved somewhat more often than the mandible. The earliest sign is loosening of the teeth in relation to the tumour (usually the molars and premolars). Later the gums expand as the tumour growth leads to gross disfigurement (*Fig. 192*). Sometimes there are multiple swellings involving one or more maxillae and one or more mandibles.

Other manifestations, which give rise to typical physical signs for these conditions, are exophthalmos due to orbital tumours, ovarian tumours, retroperitoneal lymph-node masses, other bone swellings and salivary-gland tumours. As cure by chemotherapy is possible early diagnosis is important.



## THE MANDIBLE

**Fracture of the Mandible.**—That the patient has fractured his jaw usually is evident. He endeavours to support the fragments with his hands. Speech is im-

possible, and frequently the saliva is blood-stained, because the fracture is nearly always *compound* into the mouth. Most fractures of the mandible occur in its horizontal portion. By inspection utilizing a torch, within the mouth some deformity in the contour of the alveolus may be seen—frequently a tooth appears out of alinement. The gum is sometimes found to be lacerated in this situation. Should the fracture be bilateral, take immediate precautions to prevent the tongue falling back and causing asphyxia.

*Fracture of the Condyle.*—Pain and swelling over the temporomandibular joint are the only clinical manifestations if there is little displacement of the fracture. With marked displacement the signs are those of dislocated jaw (*see p. 92*).

**Examination of the Mandible for Conditions other than Suspected Fracture.**—The body, the angle, and the inferior part of the ramus are accessible to the palpating fingers both from without and from within the mouth, where the examination is blended intimately with that of the teeth of the lower jaw. On the other hand, the upper portion of the ramus and its



Fig. 193.—Bimanual examination of the ascending ramus of the lower jaw. One finger is within the mouth.



Fig. 194.—Median mental sinus.

condyloid and coronoid processes lie deeply. With one finger inside the mouth and the fingers of the free hand applied externally (*Fig. 193*) this comparatively inaccessible portion becomes palpable.

*Alveolar Abscess of the Mandible.*—*See p. 118.*

*Median Mental Sinus* is so characteristic as to make diagnosis at first sight almost a certainty. On the point of the chin, exactly in the middle line, there is a discharging sinus (*Fig. 194*). Pain is not a feature. A radiograph of the mandible reveals nothing abnormal, but a dental film of the lower incisor teeth, which on clinical examination often appear to be sound, shows an area of rarefaction around one or both roots (*Fig. 194, inset*); pus from a root abscess has tracked between the two halves of the lower jaw to the point of the chin. When the clinician is unfamiliar with this condition, almost invariably infected sebaceous cyst is diagnosed.



*Neoplasms of the Mandible.*—Primary neoplasms attack the mandible less frequently than the maxilla. However, carcinoma secondarily invading the mandible from the floor of the mouth is not uncommon. The principal primary neoplasm of the mandible is an *adamantinoma*, which is a slow-growing, locally malignant tumour affecting young adults more frequently in the mandible than in the maxilla. It arises from the enamel organ, and gradually and painlessly expands the bone. It feels hard at first but in advanced cases egg-shell crackling (areas of softness) can be elicited. Unaccountably it is relatively common in tropical Africa.

### EXAMINATION OF THE FIFTH CRANIAL NERVE

**Motor.**—Palpate the temporal and masseter muscles. Ask the patient to clench his teeth and note whether these muscles contract. Next direct him to open his mouth as widely as possible. If there is weakness of the pterygoid muscles of one side, the jaw will deviate to the paralysed side.

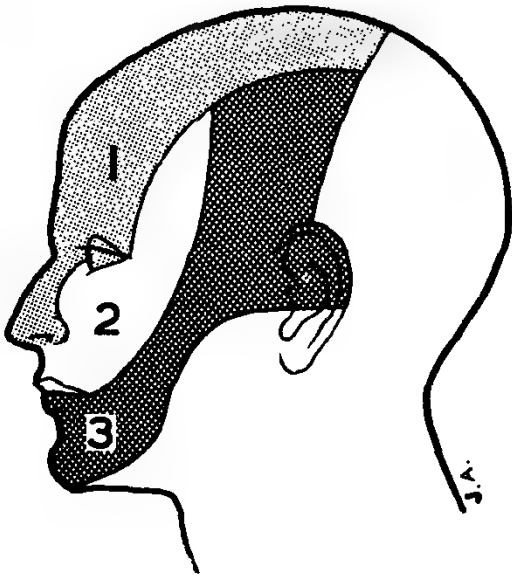


Fig. 195.—Areas supplied by the divisions of the fifth cranial nerve.

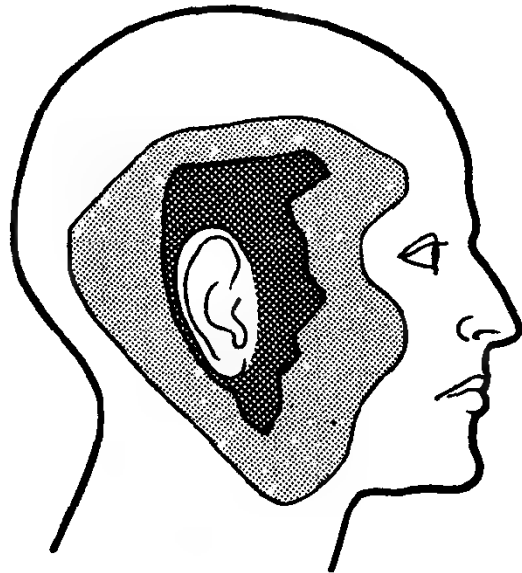


Fig. 196.—Frey's syndrome. Dark area, region of sweating; light area, region of hyperaemia.

**Sensory.**—*Trigeminal Neuralgia* begins almost invariably in either the second or third division (Fig. 195) of the fifth nerve. Ask the patient where the pain began. Sufferers can often map out accurately the distribution of the pain. 'Eating will bring it on in some persons; talking, or the least motion of the face, in others. The gentlest touch of the hand or the handkerchief will bring on the pain, while strong pressure has no effect' (Fothergill).

*During an attack* the affected area is hyperaesthetic, as can be shown by stroking it with cotton-wool.

*Between the attacks.* When the patient is examined carefully one or more *trigger zones of Patrick* will be found. Somewhere in the area supplied by the nerve—on the skin of the face or the mucous membrane of the cheek or gum—a hyperaesthetic area can be demonstrated, and a light touch on this zone initiates an attack. Curiously, the trigger zone is often in an area supplied by one division of the nerve, and the pain commences in another. In the earlier stages the patient

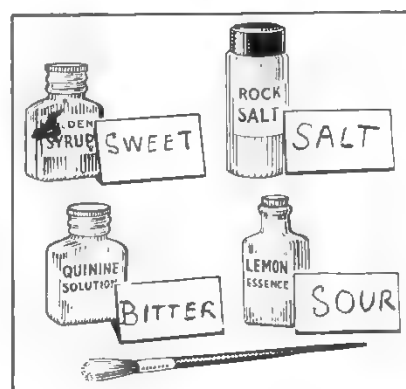
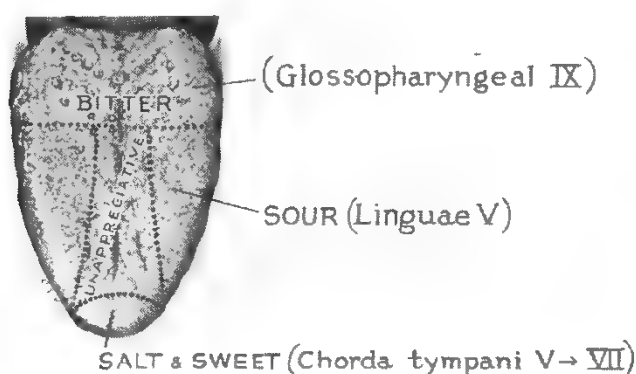


believes she has toothache, and often one tooth after another, sound or carious, is removed.

**The Gustatory Sweating Syndrome** (syn., Frey's Syndrome).—This is often a sequel to an incision for suppurative parotitis. In eastern Europe it was encountered fairly frequently (typhoid fever and typhus having been a common cause of parotitis). It is now seen occasionally after parotidectomy. The following occur while eating, especially highly spiced or sour foods and, strangely, sometimes chocolate:

1. Attacks of pain in the area supplied by the auriculotemporal nerve.
2. Unilateral facial flushing.
3. Unilateral sweating. During an attack beads of sweat stand out and trickle down the patient's cheek (*Fig. 196*).
4. Hyperaesthesia over the cutaneous distribution of the auriculotemporal nerve.

**Testing Taste.**—Loss of taste usually results from a complete lesion of the fifth cranial nerve, following a fracture of the middle cranial fossa, an operation for trigeminal neuralgia, or an alcohol injection of the Gasserian ganglion. Another cause is a cerebral tumour in the pathway of the gustatory fibres.



*Fig. 197.*—Normal areas of appreciation of taste, and their nerve-supplies. *Right*, the equipment for the test.

Special, but simple, requirements are essential and—in order to make an unhurried examination as well as to be in possession of the necessary armamentaria—it is advisable to pre-arrange a consultation for this examination only. The patient is not allowed to speak during the examination, but is instructed to point to the appropriate card (*Fig. 197, right*). (Harris.)



*Fig. 198.*—Complete right-sided facial palsy following a fracture of the base of the skull. Showing the typical response to the request, 'Shut your eyes'.

The freshly washed camel-hair brush is also washed thoroughly after each of the four substances has been painted on the desired area (*Fig. 197*). Ten seconds must elapse for the patient to perceive, then he or she indicates. After each application of the four substances, first to the believed affected, and secondly to the non-affected side, the patient rinses her mouth with warm water.

### EXAMINATION OF THE SEVENTH CRANIAL NERVE

Ask the patient to shut the eyes tightly, and at the same time to show the front teeth. In case of a complete lesion of the seventh nerve the immobility of one-half of the face becomes obvious. The patient cannot shut the eye on the affected side, and in the attempt to do so the

LUCJA FREY, 1889–1944, *Physician, Neurological Clinic, Warsaw. She was killed during the German occupation of Poland.*

JOHANN L. GASSER, died 1765, *Professor of Anatomy, Vienna.*

WILFRED HARRIS, 1870–1960, *Physician, St. Mary's Hospital, London.*

eyeballs are rolled upwards, giving rise to the well-known unsightly 'blind man' appearance (*Fig. 198*).

When a patient neither bears the scar of a mastoid operation nor that of an operation for removal of a parotid tumour, nor gives a history of a severe head injury, Bell's palsy is the probable diagnosis, in which case a history of exposure to cold or to a draught is relevant.



*Fig. 199.*—Showing the 'tear which does not fall' and partial paralysis of the orbicularis oculi. Case of complete removal of the parotid gland for malignant disease.



*Fig. 200.*—Testing the strength of the orbicularis oculi. The left eye cannot be kept shut. (Same patient as *Fig. 199*.)



*Fig. 201.* — Left-sided facial paralysis; the answer to the request, 'Show your teeth'.



*Fig. 202.*—Paralysis of the quadratus labii inferioris—the phenomenon of the vermilion surface of the lower lip during smiling.

In cases of incomplete palsy, a more painstaking examination is required. It is advisable to divide the examination into two parts:—

1. *The Examination of the Upper Face.* —On the affected side the eye usually contains 'the tear which does not fall' (*Fig. 199*). Ask the patient:—

a. To raise his eyebrows. In facial paralysis the forehead will remain smooth owing to paralysis of the occipitofrontalis.

b. To frown. There will be no furrowing owing to the loss of power in the corrugator supercilii.

c. To shut his eyes. The strength of the orbicularis oculi is tested by attempting to open the eyes against the patient's efforts to keep them shut (*Fig. 200*).

2. *The Examination of the Lower Face.*—The muscles of the lower part of the face are now tested. Ask the patient: (a) To puff out his cheeks. (b) To whistle. (c) To show the teeth (*Fig. 201*).

The upper facial muscles are represented on both sides of the cortex; the lower facial muscles have only a unilateral representation. Therefore it follows that in a unilateral supranuclear lesion of the seventh nerve the upper facial muscles tend to escape, i.e., the eye can be closed on that side.

**Unilateral Paralysis of the Lower Lip.** Paralysis of the quadratus labii inferioris results from severing the cervical branch of the facial nerve during such operations as block dissection of the neck, excision of the submandibular salivary gland, or even during drainage of an abscess of the neck. When the patient is asked to show the teeth, the vermilion surface of the affected side becomes narrower (Schwarz) as the paralysed half of the lower lip is stretched by being drawn towards the sound side. At the same time the immobile portion of the lip *appears* to be drawn upwards, because the sound side moves downwards (*Fig. 202*).

#### EXAMINATION OF THE NINTH CRANIAL NERVE

The sign of a lesion of the ninth nerve is loss of taste in the posterior third of the tongue (*Fig. 197*).

Trigeminal neuralgia and *glossopharyngeal neuralgia*, which is one hundred times less frequent, are alike, except for the localization of the paroxysms of agonizing pain and the areas of the trigger zones. In the latter the pain is brought on more frequently by swallowing than by any other stimulus. The trigger zones include the pharyngeal wall, the base of the tongue, and especially the tonsillar region. To the patient the pain may seem to be in the ear. There is no difficulty in differentiating trigeminal neuralgia, affecting the second division of the fifth nerve, from glossopharyngeal neuralgia, but when the third division of the fifth nerve is affected, considerable care must be exercised in elucidating the exact area maximally involved.

## CHAPTER X

## THE SALIVARY GLANDS

## THE PAROTID GLANDS

WHEN a patient presents with a swelling the site of which conforms with the surface marking of the parotid gland (*Fig. 203*), proceed as follows:—

*Inspection.*—Highly characteristic of general enlargement of the parotid salivary gland is a swelling in front of the tragus that extends downwards and slightly backwards, obliterating the normal depression situated below and in front of the lobule of the ear (4 in *Fig. 203*).

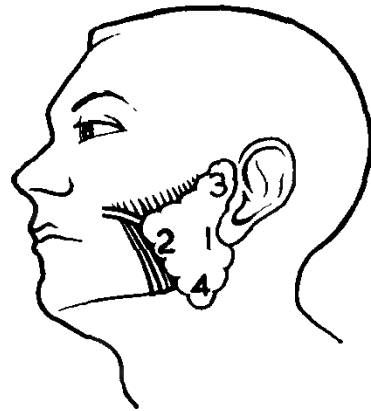
*Palpation.*—The following methodical technique can be recommended:—

1. Lay the pulps of the fingers over the main body of the gland. Ascertain the consistency of the swelling, and whether or not it is tender.

2. The anterior limit of the parotid is difficult to define, but if the patient clenches his teeth the masseter muscle is thrown into relief. The gland overlies the superficial surface of this muscle to a variable extent.

3. Palpate the superior third of the gland. If there is a fullness here, make certain that it is continuous with the main body of the parotid gland, for the pre-auricular lymph-node overlies the gland in this vicinity.

4. Lay the fingers over the inferior third of the gland. As has been stressed in the section on inspection, if the whole parotid gland is enlarged there is always a fullness over the postero-inferior part of the gland (4 in *Fig. 203*).



*Fig. 203.*—The routine for palpating the parotid gland advised in the text.

*Inspection of the Orifice of the Parotid (Stensen's) Duct* which lies opposite the second upper molar tooth. Retract the cheek with a spatula. If gentle pressure exerted over the gland from without causes a gush of purulent saliva, or a drop of thicker pus exudes (*Fig. 204*), the diagnosis of parotitis, which up to that time had been in doubt, becomes indisputable.

*Enlargement of the Deep Lobe.*—Very occasionally a parotid tumour involves the deep lobe only. External examination, as detailed above, suggests that the swelling is in the parotid gland, but it feels more deeply placed than usual. Inspection of the pharynx (*see p. 130*) reveals an apparently enlarged tonsil due to its displacement. A bimanual examination similar to that depicted in *Fig. 214* confirms that the externally felt tumour is continuous with the swelling displacing the tonsil.

**Acute Parotitis** gives rise to a brawny swelling (*Fig. 205*) involving the whole gland. In addition, the swelling is extremely tender and the overlying skin feels warmer than that on the contralateral side. Occasionally the phenomenon displayed in *Fig. 204* can be witnessed, but in these circumstances the pressure exerted over the gland may cause unjustifiable pain. Even when a discharge of purulent fluid

down the duct cannot be seen or evoked, the ampulla of Stensen's duct may display evidence of inflammation. When it is doubtful as to whether there is, in fact, a minor degree of redness in the region of the ampulla, it should be compared with that of the opposite side.

*Bilateral Enlargement* of the parotid glands is not always due to mumps; cases of acute, subacute, and chronic parotitis, consequent upon bacterial infection,



Fig. 204. —Examining the orifice of Stensen's duct. Purulent saliva is seen being ejected in this case of subacute parotitis.



Fig. 205. Acute suppurative parotitis. The whole of the parotid gland is enlarged.

occur. Painless bilateral enlargement is found in some cases of cirrhosis of the liver and some types of malnutrition.

**Chronic Parotitis.**—The swelling is almost, if not entirely, *painless*. Recurrent unilateral enlargement of the parotid gland is rarely due to a calculus; recurrent subacute and chronic parotitis are the usual causes (Fig. 206).

**Suspected Parotid Salivary Calculus.**—Compared with submandibular salivary calculus (see p. 105), a stone in the parotid gland or its duct is rare. If the history suggests salivary colic (attacks of pain occurring before and during meals), followed by a swelling of the parotid gland, the course of the duct, which lies about one finger-breadth below the inferior border of the zygomatic bone, should be palpated for a calculus. The anterior part of the duct can be palpated satisfactorily between the finger and thumb, the finger being in the mouth (Fig. 207), but the major part is rendered inaccessible to the examining fingers by the intervention of the strong masseter muscle. Radiology is essential for confirmation of the diagnosis.

#### **Differential Diagnosis of Recurrent Parotid Enlargement: —**

1. *Idiopathic Hypertrophy of the Masseter Muscle* is described on p. 91.
2. *Pre-auricular Lymphadenitis.*—The swelling is situated immediately in front of the tragus. Inflammatory oedema is wont to extend over much of the surface marking of the parotid gland, but the normal depression (see 4 in Fig. 203) is not obliterated. A primary focus of infection must be sought (Fig. 208). Usually this is to be found in the region of the eyebrow, an eyelid (including the lacrimal gland), or the conjunctiva of the same side. More rarely, the focus is situated within the external auditory meatus (furuncle and otitis externa, see p. 82). Abscess connected with a breaking-down pre-auricular lymph-node is described on p. 90.



Lastly, should no cause be found for an enlarged pre-auricular lymph-node, remember that a reticulosis or tuberculosis may first become manifest in this situation and arrange for a biopsy.



Fig. 206.—Chronic parotitis. Recurring attacks of painful swelling of the parotid gland have occurred for many years. Inset: sialogram of this case, showing greatly distended ducts and alveoli (sialectasis)\*.



Fig. 207.—Palpating the distal third of Stensen's duct.

#### TUMOURS OF THE PAROTID GLAND

**A Mixed Parotid Tumour** (Pleomorphic Salivary Adenoma) is peculiar in remaining benign for many years and seldom (2-3 per cent) undergoing a malignant change, but having a strong tendency to local recurrence if inadequately removed. It is, of course, possible for a neoplasm to arise in any part of the parotid gland; nevertheless most mixed parotid tumours have their beginning in a comparatively circumscribed area—a little in front of and above the angle of the jaw (Fig. 209). So constant is this finding that it may be described as the typical location of this neoplasm.

The only other common starting-point (and it is much less common than the foregoing) is in the region immediately in front of the tragus. Here the differential diagnosis between an enlarged pre-auricular lymph-node and a small mixed parotid tumour is, at a first examination, sometimes impossible, unless some cause for an enlarged lymph-node can be discovered. When the patient opens the mouth sometimes the forward excursion of the condyle of the mandible beneath the lump throws the swelling



Fig. 208.—The lymphatic field of the pre-auricular lymph-node.

\* *Sialectasis*. Dilatation of the ducts and alveoli of the (parotid) salivary gland. Likened to *bronchiectasis* of the lung and probably of similar aetiology.

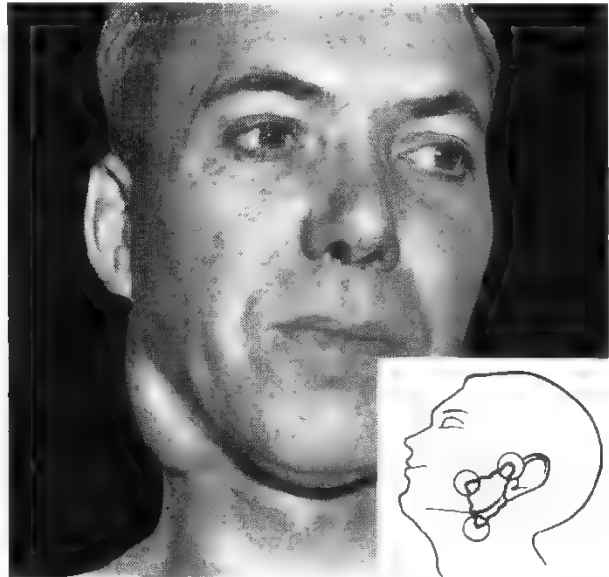
into prominence, and although the phenomenon has no diagnostic significance, it does enable the lump to be palpated more thoroughly.

Occasionally a mixed tumour arising at the periphery of the gland causes difficulty in diagnosis (*Fig. 210*). Such a swelling can occur at any of the positions shown in the inset to *Fig. 210*.

**Adenolymphoma** (Warthin's tumour) is generally softer (sometimes fluctuant) than the above; tends to occur only in males not of coloured race; and is seen only after the fortieth year. These points may enable a clinical distinction from mixed parotid tumour, but usually histological examination of the excised swelling is necessary.



*Fig. 209.*—A mixed parotid tumour in the most characteristic situation.



*Fig. 210.*—This swelling in the neck proved to be a mixed salivary tumour arising from the periphery of the parotid gland. *Inset*, three situations in which peripheral parotid swellings may be found.

**Relatively Advanced Tumour of the Parotid Gland.**—As the lump is painless, it is not uncommon for the patient to procrastinate for years or even be advised by his doctor 'not to worry about it'. Thus the neoplasm not infrequently is in an advanced stage when first seen. When the tumour has been present for some time, or is large, proceed as follows:—

By testing the mobility of the tumour, endeavour to find out if it is still innocent. Remember that the clinical examination of a parotid tumour is not complete without testing the functional integrity of the seventh cranial nerve (*see p. 98*); although the facial nerve is related intimately to the parotid gland, its function is unimpaired unless the tumour is malignant (either *de novo* or secondarily) or in the case of a recurrent tumour, the nerve has been damaged at the previous attempt at removal.

**Carcinoma of the Parotid Gland.**—As indicated, this may occur as a primary event or, rarely, complicate a long-standing mixed tumour. A painless, rapidly enlarging, recent tumour is suggestive of carcinoma, and facial palsy is proof-positive. An examination of the cervical lymph-nodes is indicated; metastases occur only in advanced cases. Carcinoma is not as uncommon as is sometimes alleged; in large series some 10–20 per cent of parotid tumours are malignant.

**Cyst of the Parotid.**—Most true cysts of the parotid gland occur in the region overlying the angle of the mandible, and it seems probable they are derived from the first branchial cleft. The condition is far less common than adenolymphoma, which, however, is seldom so fluctuant as a true cyst. If the diagnosis is suspected needle aspiration, if successful, will cause the swelling to disappear (cf. Cyst of Breast, p. 174). Occasionally a main branch of the parotid tree, occluded by a calculus, gives rise to a cyst.

**Mikulicz's Disease.**—Is characterized by symmetrical, and usually progressive, enlargement of the lacrimal and salivary glands, with a replacement of the glandular tissue by lymphocytes. It involves the parotid, submandibular, sublingual, and frequently the accessory salivary glands. Usually the disease occurs in persons between 20 and 40 years of age who at first have paroxysms of enlargement of these glands lasting from a few hours to several weeks. In a few cases regression occurs; in the majority the enlargement becomes stationary. Dryness of the mouth is a regular accompaniment of fully established Mikulicz's disease. In the beginning one gland alone, often the lacrimal, is attacked, and the diagnosis can be established only by histological examination. The disease is probably an early stage or precursor of Sjögren's syndrome in which dryness of the eyes and rheumatic joint changes are superadded to the above features.

## THE SUBMANDIBULAR SALIVARY GLAND

### SUBMANDIBULAR SALIVARY CALCULUS

**Inspection of the Submandibular Triangle.**—An enlargement of the submandibular salivary gland causes a swelling beneath and in front of the angle of the jaw.



*Fig. 211.*—Intermittent enlargement of the submandibular salivary gland. It became evident after the patient had sucked a lemon. Case of a stone in the submandibular duct.



*Fig. 212.* Stone impacted in the ampulla of the right submandibular duct, resulting in saliva being ejected from the left duct only.

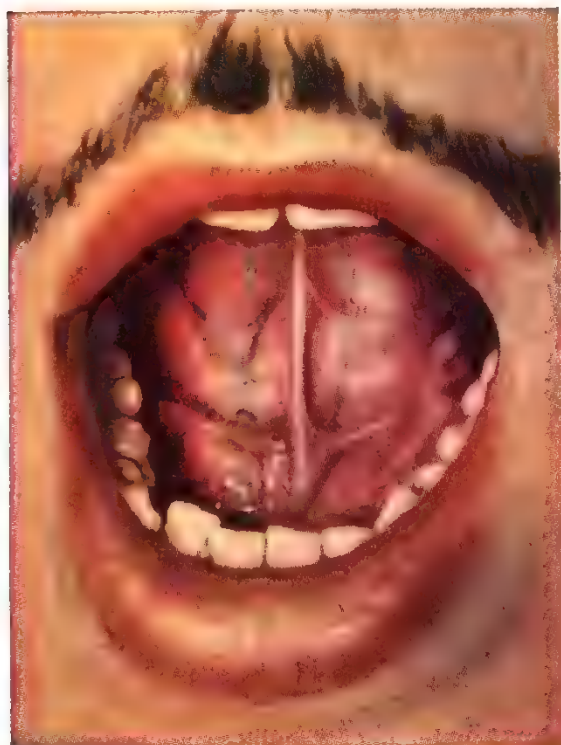
When the patient volunteers the information that the swelling appears only either just before or during meals, ask him to suck a little lemon or lime juice. An interesting and diagnostic phenomenon may be witnessed (*Fig. 211*) which is proof positive that Wharton's submandibular duct is obstructed. A swelling situated in the



submandibular triangle that appears, or if present already, enlarges before one's very eyes, can be none other than a swelling of the submandibular salivary gland. On the other hand, a swelling that occupies the triangle, but remains constant in size, is not necessarily a swelling of the salivary gland and must be differentiated from other swellings of this region. Assuming that the swelling does vary in size, the next step is:—

**Inspection of the Floor of the Mouth.**—The orifices of the submandibular ducts are inspected with the aid of a torch, and the two sides compared. In about 40 per cent of cases of submandibular salivary calculus some aberration is visible on the affected side of the floor of the mouth, namely: when secondary infection has supervened the ampulla is likely to be inflamed; sometimes pus can be seen exuding from the orifice of the duct. Occasionally a stone impacted in the ampulla will be observed (*Fig. 212*).

Especially if there is no obvious abnormality present, it is essential to ascertain



*Fig. 213.*—Saliva is flowing from the orifice of the duct on the right side, but on the left there is no secretion, for the posterior part of the duct is blocked by a calculus.



*Fig. 214.*—Bimanual palpation of the submandibular salivary gland utilizing a disposable glove.

whether the flow of saliva from the suspected submandibular gland is impeded. This can be determined there and then in the following manner:—

A dry swab is inserted under the tongue, and some lemon juice is placed upon the dorsum. The patient is then asked to keep the swab in place with his finger while he moves the tongue about so as to taste the juice. He is then instructed to open the mouth widely, and to raise the tip of the tongue towards the roof of the mouth. The swab is removed and, quickly, the (dried) floor of the mouth inspected. Normally, saliva can be seen flowing, occasionally being ejected, from both ducts. In cases of obstruction by a calculus there will be little or no secretion from the affected side (*Fig. 213*). Finally, the fingers are placed on the skin overlying the submandibular triangle, and steady pressure is exerted on the gland. This may evoke a gush of saliva or purulent exudate in cases where the duct is partially occluded.

**Palpation of the Submandibular Salivary Gland.**—As there are two portions, a larger (cervical) beneath, and a smaller (buccal) above the mylohyoid muscle, there can be but one efficient method of examining the whole gland, and that is by bimanual palpation (*Fig. 214*). If it can be ascertained that there are contiguous intrabuccal and cervical swellings, this is good evidence that the swelling in question is an enlarged submandibular salivary gland.

**A Method of Palpating the Submandibular Duct.**—Dentures, if any, are removed. The patient's head is flexed and inclined somewhat to the affected side, in order to relax the musculature. The index finger is inserted into the mouth, the pulp of the finger being placed upon the internal surface of the alveolus. The finger is passed backwards, following the alveolus until its posterior extremity is reached. The tip of the finger is insinuated between the alveolus just behind the last molar tooth and the side of the posterior third of the tongue, and rotated through a right-angle, so that the pulp of the finger is directed downwards. In conjunction with the fingers of the other hand beneath the jaw, the whole course of the duct is palpated for a calculus, from behind forward. Sometimes this manœuvre brings on retching, but even in this event the valuable information required is elicited before the patient experiences any severe discomfort.



*Fig. 215.*—Tuberculous submandibular lymphadenitis. The swelling does not vary in size and on bimanual palpation there is no contiguous swelling in the floor of the mouth.



*Fig. 216.*—An enlarged facial lymph-node. There is an inconstant lymph-node in juxtaposition to the facial artery as it winds around the mandible.

**Differential Diagnosis.** *From Enlarged Submandibular Lymph-nodes.*—When, on bimanual palpation (*see Fig. 214*), a cervical (as opposed to a cervical + a buccal) swelling alone is palpable, enlarged submandibular lymph-nodes (*Fig. 215*) are the probable cause of the lump. Often such nodes are blended intimately with the capsule of the submandibular salivary gland.

*From an Enlarged Facial Lymph-node.*—An enlarged lymph-node, in relation to the facial artery situated in juxtaposition to the site where the pulse of that artery is sought, is, thanks to the constant position of this lymph-node when present (*Fig. 216*), capable of segregation from other swellings in this region.



The differentiation of the swelling from a *neoplasm* will now be discussed:—

**Tumours of the Submandibular Salivary Gland** are uncommon compared with enlargement of the gland due to calculus and also with parotid tumours.

A *Mixed Tumour* presents with a slowly growing tumour of moderate size (Fig. 217). The lump is hard but could not be called *stony hard*. All the same, the precaution should be taken of requesting a radiograph of the region to exclude the possibility that the lump is an enlarged gland behind a calculus.

*Carcinoma of the Submandibular Gland* (Fig. 218) is rare.



Fig. 217.—This enlargement of the submandibular salivary gland, present for many months, did not vary in size. Case of mixed tumour.



Fig. 218.—Carcinoma of the submandibular salivary gland fungating through the skin.



Fig. 219.—Myxomatous degeneration of the left gland of Blandin and Nuhn on the under-surface of the tongue.

Before concluding this subject, the possibility of a swelling in the submandibular triangle being due to a primary or secondary neoplasm of the submandibular lymph-nodes must be considered. Regarding the latter, the primary growth must be situated either on the upper lip (not forgetting its buccal surface) or, far more frequently, on the anterior two-thirds of the tongue or the floor of the mouth.

#### THE MINOR SALIVARY GLANDS

**The Sublingual Gland.**—Amidst all the affections to which the salivary glands are heir, the sublingual glands seem practically immune. An exception to the rule is Mikulicz's disease. It is, however, likely that a ranula (*see* p. 126) is a cystic degeneration of the sublingual gland.

**The Inferior Lingual Gland of Blandin and Nühn.**—On rare occasions this gland undergoes cystic degeneration, in which event, if the normal location of the gland is known, the diagnosis is written on the face of the swelling (*Fig. 219*).

**Tumours of Ectopic Salivary Glands** are described on p. 129. Although known as 'ectopic', in point of fact, normally, tiny salivary glands are scattered over the palate and the nasopharynx, and neoplasms of these glands are not uncommon, while those of the named minor salivary glands (i.e., the sublingual glands; the gland of Blandin and Nühn) are of utmost rarity.

## CHAPTER XI

## THE MOUTH

THE multiplication of instruments and apparatus designed to reveal hidden pathological conditions sometimes makes the practitioner lament that he lacks facilities for special examination. In the case of the mouth this is certainly not true. Seated in his consulting room, armed with little more than an electric torch and a spatula, he can, if he wishes, become a master of intrabuccal living pathology and diagnosis, for his opportunities are unrivalled.

## THE LIPS

*Cleft Lip.*—The hare has an upper lip cleft in the *midline*. The developmental abnormality of the lip occurring in human beings is almost invariably a *lateral* cleft, yet the inaccurate term 'hare lip' continues in general use. All degrees of cleft lip, from an interruption of the vermillion border alone to a bilateral cleft of the whole of the upper lip, are obvious.



Fig. 220.—Complete bilateral cleft lip and palate.

*Cleft Palate.*—In 50 per cent of cases a cleft lip is associated with a cleft palate; if the former is present the clinician should at once inspect the palate (*see* p. 128). Tripartite cleft palate and bilateral cleft lip go hand in hand, causing the premaxilla (morphologically the prognathion or snout) to jut out (*Fig. 220*), and while the examination of the palate must be a *sine qua non*, that there is a complete cleft palate associated with this variety of cleft lip is a certainty from the time of the first glance at the patient.

*Peutz-Jeghers Syndrome* (Pigmentation of the Lips and Intestinal Polyposis).—When a patient displays multiple pigmented spots, varying from brown to black, on and about the vermillion surfaces of the lips (*Fig. 221*), this syndrome should spring to mind. The spots, which are only partially obliterated by lip-stick as usually applied, are situated in an area seldom affected by freckles, even in freckled subjects. Always inquire regarding the occurrence of similar spots on the lips of blood relations, for the condition is strongly familial and is the outward sign that a patient suffers from adenomatous polyposis of the small intestine, especially the jejunum. Such polyps bleed, intussuscept, and rarely become malignant. Occult blood is present in the stool, and attacks of melaena (*see* p. 20) are frequent.

*Angular Stomatitis* (Cheilosis\*).—Brownish superficial ulceration at the corners of the mouth with scabbing, which is often picked or licked off, presents but little difficulty in diagnosis. The condition occurs as a simple infection in children of school age ('perlèche'†). In cases of some standing, moist fissures appear. Always examine the related mucous surface. The fissuring of congenital and tertiary syphilis is deeper, extends on to the mucous membrane, and leaves permanent scars (*see*

\* *Cheilosis*. Greek, *χεῖλος* — a lip. Cracks at the corners of the mouth.

† *Perlèche*. French, *pourlécher* — to lick.

*below*). *Perlèche* does not extend on to the mucous surface, and it heals without scarring.

Other causes of angular stomatitis are ariboflavinosis, which is prone to occur after complete or almost complete gastrectomy, sideropaenic dysphagia (*see* p. 202), or severe anaemia. Dental causes are over-closure of the mouth (*Fig. 222*) due to absence of either upper or lower teeth or dentures, and allergy to the material from which dentures are made or to lipstick.



*Fig. 221.*—The labial and circumoral pigmented spots of the Peutz-Jeghers syndrome.



*Fig. 222.*—Angular stomatitis due to overclosure of the mouth.

*Rhagades*.★—White linear scars radiating from the corners of the mouth (*Fig. 223*) suggest previous syphilitic ulceration.

Returning to the lip proper:—

*A Primary Chancre* usually is situated on the upper lip (*see Fig. 83*, p. 38).

*Carbuncle of the Upper Lip*.—This is the most dangerous situation in the body for a carbuncle. A complication that frequently heralds the oncoming of fatal pyaemia is thrombophlebitis of the cavernous sinus. A sign that foretells impending



*Fig. 223.*—Rhagades.

danger is spreading oedema from the lip to the inner canthus. When on this account the lids of one eye and then the lids of the other eye become closed it is probable that thrombophlebitis of the veins of the ophthalmic plexus has spread to the cavernous sinus (*see* p. 71).

With the above exceptions, it is the lower lip which is the site of election for pathological conditions.

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★ *Rhagades*. Greek, pl. of *ῥαγάς* = a crack.

*Aphthous*\* *Ulcer* on the lip, on the tip (*Fig. 224*) or sides of the tongue, or on the mucous lining of a cheek, is common. The ulcer is a small, superficial, very painful erosion with a white floor, a yellowish border, and surrounded by a narrow hyperaemic areola. Occasionally two or more ulcers are found. The condition usually starts in early adult life, tends to recur for some years, and is commoner in females. It is rare after the age of 50 (Sircus). In many instances the periodic appearance of these ulcers seems to be associated with environmental or emotional stress. The lesion heals spontaneously in 7–14 days and is thus seen predominantly by the general practitioner.



*Fig. 224.*—Aphthous ulcers of the lower lip.



*Fig. 225.*—Carcinoma of the lip in an elderly retired agricultural labourer.

*A Median Crack in the Lower Lip* is common in cold weather. In some individuals the crack becomes chronically inflamed, and bleeds readily.

*Actinic Cheilitis* occurs among those following an outdoor occupation in sunny climes. It gives rise to epithelial exfoliation of the lips, more especially the lower lip; small blisters recur at frequent intervals during the summer months. Actinic cheilitis recurring year after year is a precursor of carcinoma.

*Carcinoma of the Lip.*—Ninety-five per cent of cases occur on the lower lip. Much the most usual form is a flat ulcer appearing on the vermilion surface (*Fig. 225*). The ulcer advances slowly, remains shallow, and is surrounded by but little induration. More induration and deeper ulceration imply greater malignancy both locally and in the matter of early lymphatic metastasis.

*Molluscum Sebaceum* simulates a carcinoma of the lip very closely, and unless the clinician is aware of the salient features (*see p. 28*) it is highly improbable that he will be able to differentiate this innocent lesion from a carcinoma.

In order that the mucous surface of the inner aspect of the lip can be inspected, the lip must be everted fully. In addition to uncovering the full extent of an advanced neoplasm, there are two lesions that can be displayed only by this manœuvre:—

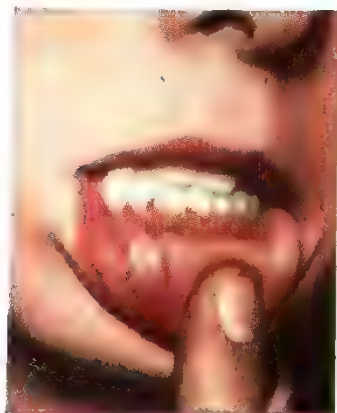
*A Retention Cyst* of a buccal mucous gland can occur anywhere in the mucous lining of the mouth, but it does so relatively frequently on the buccal aspect of the lower lip (*Fig. 226*). The cyst is blue-domed and brilliantly translucent—signs which render the diagnosis certain.

\* *Aphthous*. Greek, ἄφθα, — mouth ulcer, probably connected with ἄπτειν — to set on fire. *Aphthous ulcer* is known in the U.S.A. as 'canker sore'.

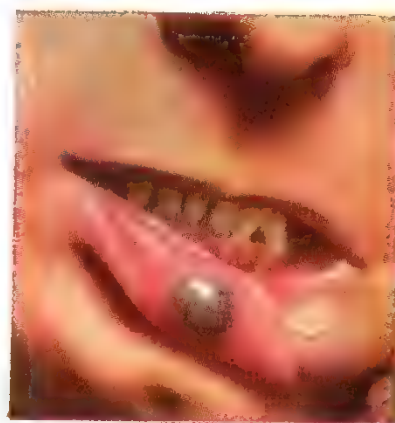


A localized *Cavernous Haemangioma* beneath the mucous membrane of the lip (*Fig. 227*), simulates the above condition, but gives the sign of emptying which in this instance can be demonstrated with precision and alacrity by pressing a glass slide on to the swelling, as described on p. 38.

*Examination of the Lymphatic Field of the Lips.*—In inflammatory and neoplastic cases examination of the lip is concluded by palpation of the cervical lymph-nodes, particular attention being paid to the submental group, which are not easy to feel when only moderately enlarged. It is also worth while to search for enlargement of the inconstant facial lymph-node (*see Fig. 216, p. 107*).



*Fig. 226.*—Retention cyst arising in the mucous lining of the lower lip. The cyst had ruptured just prior to the photograph being taken.



*Fig. 227.*—Cavernous haemangioma beneath the mucosa of the lower lip.

### EXAMINATION OF THE TEETH

The task of remembering when normal eruption occurs is aided considerably by *Fig. 228*. There is a great variation in the date of eruption of teeth in normal children: some may have teeth at birth, and others none until they are a year old.

**The General Inspection of the Teeth.**—If the patient wears a denture, insist upon it being removed before proceeding with the examination. The patient is asked to show the front teeth. The anterior surface of the exposed crowns having been inspected the lips are lifted away from the gums in order that the necks of the teeth can be scrutinized. Next the patient is requested to open the mouth, and with the aid of a spatula the more posteriorly placed teeth are examined. The use of a dental mirror is often advisable if visualization of the lingual side of a particular tooth or teeth is deemed necessary.

*Congenital Ectodermal Dysplasia* is a cause of poorly calcified deciduous\* teeth. In this disease the skin is very dry and the hair scanty. Poor formation of deciduous teeth is seen also in systemic affections with hypocalcaemia.

*Congenital Absence of a Tooth or Teeth.*—When one or both lateral incisors are missing, and there is no history of a dental extraction in this region, it is more than probable that it is a case of congenital absence of the tooth or teeth concerned—an abnormality which is practically confined to lateral incisors.

*Wide Spacing between the Upper Central Incisor Teeth* is due sometimes to persistence of, and insertion into the palate of, the infantile fraenum of the upper lip.

*Abnormally Coloured Teeth.*—Occasionally green teeth are seen in children who have had severe jaundice in infancy. Certain drugs, notably tetracycline (*Fig. 229*) when given in infancy

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\* *Deciduous*. Latin, from *decidere* = to fall off; not permanent.

cause staining of the teeth. Similar staining is seen in adults who smoke heavily and do not clean their teeth efficiently.

*Teeth bespattered with Brown or Black Pits* are due to the presence of excess of fluorides in the water the patient drank habitually during childhood and adolescence. The 0.5 parts per million used to prevent caries does not have this effect.

*Transversely Ridged Teeth* with curved notching due to wear are not uncommon in those who have suffered from rickets or deprivation of vitamins C and D while enamel deposition was in progress.

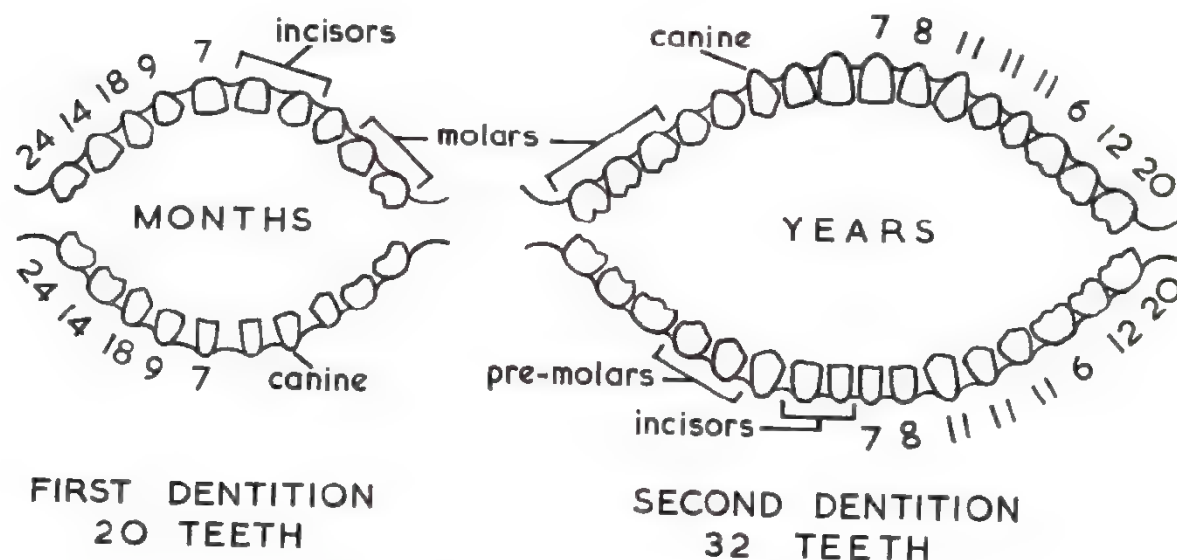


Fig. 228.—The date of eruption of each tooth.

In a patient with symptoms referable to the stomach, examination of the teeth should never be omitted. Note particularly whether there are sufficient molars in opposition with which to carry out mastication effectively.



Fig. 229. —Tetracycline staining of a child's teeth; recurrent urinary infections are treated with this antibiotic.

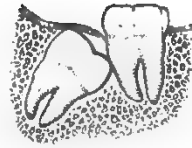
Passing now to clinical conditions of surgical importance connected with, or arising from, the teeth themselves:—

*Tartar* consists mainly of precipitated calcium salts of the saliva. Deposits of tartar are heaviest on the lingual aspect of the necks of the lower incisors, these teeth being exposed to the salivary stream of the submandibular glands, the secretion of which is particularly rich in calcium. The relationship of tartar to pyorrhoea alveolaris is described on p. 116.

*Impacted Tooth.*—A tooth that is prevented from erupting by the presence of other teeth is spoken of as being impacted. The third mandibular molar (wisdom) is most frequently prevented from erupting in this way, the maxillary canine and the maxillary third molar taking second and third places respectively. Absence of a canine tooth with no history of extraction nearly always implies that it lies impacted. Often such a tooth remains symptomless until perhaps late in life, when it gives rise to a painful, tender lump beneath the denture.

*An Incompletely Erupted Third Mandibular Molar*, which though impacted can partially erupt, is one that gives rise to severe symptoms, and is a source of danger.

In the course of attempted, but ineffectual, complete eruption, the tooth remains covered with a flap of gum, viz. —————→ or operculum,\* which is easily overlooked if not searched for especially, permits debris to collect beneath it, with suppuration following. Incomplete eruption of a wisdom tooth is the *most common cause of trismus* (see p. 92).



**Dead (Pulpless) Tooth.**—A dead tooth is one which has no living pulp. After dissolution or removal of the pulp, and closing of the pulp cavity with a filling, the dentine loses its central blood-supply. For several months after becoming lifeless a tooth changes in colour but slightly;



Fig. 230.—Congenital syphilitic central incisors. Hutchinson's tooth, left (reader's right); screwdriver tooth, right (reader's left).



Fig. 231.—A missing tooth suggested a clinical diagnosis of odontome, which later was confirmed by X-rays.

it is less white than the remaining teeth. After that time it becomes increasingly discoloured bluish-grey, most pronounced in the region of the gingival one-third, where the enamel is thinnest. A dead tooth is insensitive to ice applied to its crown.

**Hutchinson's Teeth** are good confirmatory evidence of congenital syphilis. The teeth of the *second dentition alone* are affected, and it is only the upper central incisors that afford indisputable evidence, being smaller than normal, broader towards the gum than at their free edge and notched (Fig. 230). Another characteristic tooth is the 'screwdriver' tooth (Fig. 230).

**Moon's Turreted Molars** are occasionally helpful in the diagnosis of congenital syphilis: they are dome-shaped first molars.

**Odontome.**—If the case is one of a swelling in the jaw, careful attention to the dental formula may throw light upon the diagnosis. If a missing tooth cannot be accounted for in any other way, it is fairly good evidence that the swelling is an odontome (Fig. 231), a diagnosis that must be confirmed by radiography.

### EXAMINATION OF THE GUMS

In order to examine the gums, in turn each lip must be everted fully (see Fig. 240). Visualization of the more posterior portions of the gums requires the aid of a spatula and a torch; substitution of a dental mirror for the spatula is to be commended when a better view of the posterior part, and especially of the lingual aspect, of the gum is required. Even well-developed localized lesions often escape detection for want of running the finger along each aspect of the gum.

\* *Operculum*. Latin, *operculum* = a lid.



Healthy gums are bright pink in colour. The crenated\* edge of each gum is sharply defined, firm, and closely adherent to the necks of the teeth.

*Receding Gums.*—As age advances, so the teeth appear longer, owing to recession of the gums (*Fig. 232*). Eventually, if not obscured by tartar, the rough, lustreless cementum lies exposed above the smooth, shining enamel. The process



*Fig. 232.*—'Long in the tooth.' Tartar accumulation. Pyorrhoea present.

of gingival recession is accelerated by failing to have tartar that collects on the necks of the teeth removed periodically.

*Pyorrhoea Alveolaris.*—As a consequence of recession, the periodontal membrane gives way, allowing organisms to enter and debris to collect in gingival



*Fig. 233.* Pyorrhoea alveolaris. Commencing gum retraction of the incisor teeth.



*Fig. 234.* —The gums in scurvy.

pockets that result from loss of adherence of the gums to the neck of the teeth. In many instances the teeth themselves are sound. The earliest sign of pyorrhoea alveolaris is a deep red line along the free edge of the gum, with diminution of the normal depth of crenation (*Fig. 233*). Later, if pressed, the gums bleed readily: sometimes a small bead of pus exudes. Commonly, the condition commences in that part of the gum related to the incisor teeth; untreated, it spreads. Halitosis

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\* *Crenated*. Latin, *crenatus* — scalloped, viz: 

and a pink stain on the pillow (due to dribbling of slightly blood-stained saliva) are common accompaniments.

*Vincent's Stomatitis* (Trench Mouth) is an inflammatory condition of the gingivae and adjoining mucous membrane. In addition to an acute or subacute inflammation of the gums, there is ulceration of the gingival margins with the formation of pseudo-membrane affecting particularly the interdental papillae. This is the characteristic sign of the lesion, which, together with overpowering foetor oris in acute cases, should proclaim the diagnosis.

Bacteriological confirmation of the symbiotic infection by *Borrelia vincentii* and *Fusiformis fusiformis* is most desirable although many authorities hold that these are secondary invaders consequent on a virus infection.

*Cancrum Oris* (Noma\*).—Although this has virtually disappeared in Europe and North America, it is still common in Africa, Asia, and South America. The commonest predisposing cause is measles, but malnutrition, gastro-enteritis, typhoid, and bronchopneumonia may all act as antecedents. Three-quarters of patients fall into the age-group 2–5 years. In almost all early cases the organisms of Vincent's stomatitis (see above) can be isolated (Tempest).

At an early stage a painful purple-red indurated papule is found on the alveolar margin in the molar or premolar region of the mandible, maxilla, or both. Occasionally the condition is bilateral. An ulcer forms, rapidly exposing the underlying bone and extends on to the cheek or lip which is tender and swollen. There is a foul smell and in two or three days gangrene of the involved soft tissues commences leading to a well-defined slough and a hole in cheek or lip (Fig. 235). Soon bone and teeth sequestrate, but with modern antibiotic therapy the child usually survives.



Fig. 235.—Cancrum oris of the cheek at the stage of separation of the slough.

*Scurvy*.—Bleeding from the gums is a leading sign. The gums are swollen, livid† (Fig. 234), spongy, and tender. Often the teeth become loose.

*Bleeding Gums in Uraemia*.—The gums are not so spongy as in scurvy; in fact they may look nearly normal (Wright).

*Generalized Hyperplastic Gingivitis* at first sight simulates the gums of scurvy. However, the gums are neither so spongy nor so livid, nor are the teeth loose. Commencing in childhood, it is progressive, and, unless treated operatively, the hypertrophied gums almost bury the teeth. In some cases it is unaccountably produced by newer drugs used in the treatment of epilepsy, e.g., epanutin.

*The Hyperplastic Gums of Leukaemia and Agranulocytosis*.—Especially in acute leukaemia occurring in a child, the gums are liable to become swollen, and on occasions they become so enlarged as to hide much of the crowns of the teeth. The lesion is due to extravasation of immature white cells and secondary infection. The gums bleed readily on being pressed, but unlike other conditions giving rise to hypertrophy of the gums, pyrexia is almost always present, and the patient looks manifestly ill.

\* *Noma*. Greek, *νέμειν* — to devour.

† *Livid*. Latin, *lividus* — lead coloured. The original meaning has become altered, and the term has now come to signify a deep, almost purple, red.



*Alveolar (Dental) Abscess.*—Contrary to what might be thought, X-ray evidence of an acute abscess is lacking until resorption of bone has occurred—a matter of at least ten days. Physical signs are thus extremely important in diagnosis.



Fig. 236.—History of severe toothache—pain went suddenly, then face became swollen. Dental abscess (upper molar).



Fig. 237.—Foetor, local tenderness, and some degree of trismus make the diagnosis of a dental abscess (lower molar) certain.

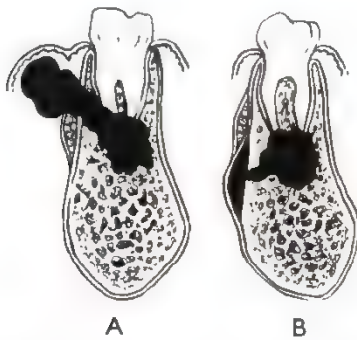


Fig. 238.—When pus breaks through the lateral alveolus of the molar region, it can do so (A) above the buccinator muscle = a gumboil, or (B) below that muscle — a swollen face.



Fig. 239. —Fibrous epulis.

When pus generated by a carious tooth breaks through the bony alveolus and its periosteum, a process that usually takes several days, the intense throbbing pain of an undecompressed root abscess is relieved. If the muscles of mastication become involved in the extending inflammation, trismus results. In order of frequency, the various directions taken by the pus are as follows:—

1. *Through the Lateral Surface of the Bone.* By passing the finger along the labial aspect of the gum a rounded, tense, tender swelling (*a gumboil*) will be felt. In chronic cases there is no tenderness, and by pressure on the swelling pus is evacuated into the mouth.

In the molar region of either jaw osseous perforation can occur either above or below the attachment of the buccinator muscle, and on this depends whether there results a gumboil (Fig. 238 A) or a swollen face (Figs. 236, 237, and 238 B).

2. *Through the Medial Surface of the Bone.* Less commonly, the pus bursts through the medial plate of the alveolus, and in the upper jaw leads to a palatal abscess. In the lower jaw a gumboil on the lingual aspect of the alveolus results.

**Epulis\*** is a term applied to a swelling arising from the alveolar margin of either upper or lower jaw. There are several varieties which require microscopical examination after excision or biopsy for verification of the diagnosis.

*Fibrous Epulis* is a tumour of the periosteum of the alveolus, or of the periodontal membrane. It appears as a nodular mass upon the surface of the gum (Fig. 239), often pushing up between two teeth. The attachment of the tumour can be sessile or, more rarely, pedunculated. In colour, it is grey to slightly brighter pink than that of the normal gum; it is a non-tender swelling, elastic in consistency, and slow of growth.

*Granulomatous Epulis* is softer, more rapidly growing, and is of a bright red colour (Fig. 240). It bleeds when the teeth are brushed. Often it is found adjacent to a carious tooth or an ill-fitting denture (Fig. 241). Sometimes it is found, temporarily, during pregnancy.

A *Giant-celled Epulis* is an osteoclastoma, situated in, and expanding, the alveolus. It nearly always occurs between the ages of 10 and 25 years. The swelling is painless, and is much more frequently situated in the mandible than in the maxilla.

*Epitheliomatous or Carcinomatous Epulis* presents the same characteristics as other buccal cancers (see pp. 125, 127). It is an epithelioma of the mucosa of the alveolar margin.

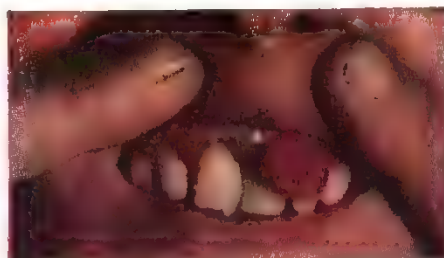


Fig. 240.—Granulomatous epulis.



Fig. 241.—Denture granuloma.

*Conditions arising from an Ill-fitting Denture.*—If a patient complaining of a sore gum wears a denture, examine the gums with special reference to the plate, which is removed for the pur-



Fig. 242.—Bismuth line in a patient who had undergone anti-syphilitic treatment.

pose. Among the conditions directly due to an ill-fitting denture are the following:—

*'Prosthetic' Ulcer:* An ulcer develops on the gum at a point of pressure. There is considerable erythema of the mucous membrane in the neighbourhood. Usually the condition occurs with recently fitted dentures

*Denture Granuloma* = Granulomatous Epulis above.

*The Lead Line* is a sign for which to look in patients who work with lead, e.g., painters, and who complain of colicky abdominal pain. The 'blue line' if inspected closely will be seen to

\* *Epulis*. Greek, ἐπί = upon + οὖλον = gum.

consist of a series of grey-black dots situated about 1 mm. from the free margin of the gum. They are best seen with the aid of a magnifying glass. Almost identical with the lead line are the bismuth (*Fig. 242*) and mercury lines. 'Metal' lines are less commonly encountered than formerly, owing to the better protection of workers in these metals and the abolition of their use in the treatment of syphilis.

### EXAMINATION OF THE TONGUE

**Examination of the Anterior Three-quarters.**—The tongue in relation to the general condition of the patient has been described on p. 8. Here abnormalities and diseases will be considered. If the history suggests a lesion, proceed as follows:—

Ask the patient to put out his tongue. Abnormalities of the *dorsum* are apparent immediately.

**Size of the Tongue.**—It is the acutely inflamed organ that commonly is larger than normal, because of oedema. Muscular hypertrophy (muscular macroglossia) is seen in cretins. Diffuse benign neoplasms are rare causes of enlargement.



*Fig. 243.*—Congenital short fraenum lingulae. The tip of the tongue has been rolled upwards.



*Fig. 244.*—Displaying the lateral border of the tongue and its terminal recess. A carcinoma in this recess is often missed for want of employing this method of examination.

**Restricted Mobility.**—Note whether the organ is protruded in the midline. If it is deviated, do not jump to a conclusion, for often the patient will deliberately rotate his tongue because he is trying to show you something on one side of it. Ask the patient to put his tongue straight out as far as he can. It is now possible to arrive at a decision whether there is any deviation to one side, or inability to protrude the organ to a normal extent. Lateral deviation is due either to unilateral infiltration of the lingual musculature by a carcinoma, or to a lesion of the hypoglossal nerve (*see p. 60*). In both instances the deviation is towards the side of the lesion. Inability to protrude the tongue fully (ankyloglossia) occurring in a patient past middle life almost invariably signifies advanced neoplastic infiltration of the lingual musculature, while in a young individual it is likely to be due to a congenitally short fraenum lingulae ('tongue-tie', *Fig. 243*), a rare condition that is revealed only when the patient is directed to put the tip of the tongue on the back of the roof of the mouth.

Continuing routine examination, ask the patient to rotate the tongue upwards towards the roof of his mouth. This reveals the *under-surface* and the floor of the mouth.

The greater part of the *lateral borders* can only be seen if the cheek is retracted with a spatula and the angle of the mouth by an assistant's index finger. To grasp the forepart in a swab, and gently to pull the tongue forward in the opposite direction, permits not only the whole of one lateral border to be seen clearly, but displays that inaccessible recess between the lateral base of the tongue and the anterior pillar of the fauces (*Fig. 244*).

**Palpation of the Posterior Quarter of the Tongue and the Valleculae.**—A primary carcinoma lurking in this region can be detected quite easily by means of a gloved finger, and this manœuvre should be undertaken at the slightest provocation (i.e., discomfort at the back of the tongue; slight dysphagia; doubtful ankyloglossia) when no primary tumour is visible, and also the better to determine the extent of infiltration when only some portion of the neoplasm can be seen at the back of the tongue. Only in the presence of a hyperactive gag reflex must the patient be provided with a surface anaesthetic tablet, to be sucked 10 minutes before the examination.

Ask the patient to open the mouth widely. Holding *all* the fingers of the left hand stiff and straight, press the finger-tips firmly into the cheek (*Fig. 245*) in such a way that they intervene between the teeth (*Fig. 245*, inset). Should the patient 'bite', he will bite his cheek and not your palpating right index finger.

**The Lymphatic Drainage of the Tongue.**—No examination of the buccal cavity is complete without the systematic palpation of the cervical lymph-nodes (*see p. 140*). Palpate the neck thoroughly, remembering that the anterior third of the tongue drains first into the submental nodes, the middle third into the submandibular nodes, and the posterior third into the deep cervical nodes. Cross-metastases are not uncommon, and occasionally the nodes of the jugular chain are the first to become palpable.

At this juncture, a number of clinical entities will be described, and many of them will be illustrated. True, some of these lesions are rare, but unless the reader's attention is directed to them, how else can he or she recognize one or other of them should it be encountered? Especial attention is drawn to those benign conditions that simulate carcinoma.

**Leucoplakia\*** (Chronic Superficial Glossitis).—The normal surface of the dorsum of the tongue is lost. The white colour (and its varying shades of grey) of the thickened patches of epithelium which have lost their papillae is a characteristic sign (sometimes affecting the cheek). Nowadays comparatively few (predominantly males) give a history of syphilis, and in one-third of all cases of carcinoma of the mouth the neoplasm is preceded by leucoplakia; on the other hand, leucoplakia is not necessarily followed by carcinoma.

Early lesions are thin, crinkled, and pearly (*see Fig. 260*); older lesions, which are larger owing to coalescence of smaller ones, are creamy-white, thick, and desquamate from time to time, leaving a beefy-red base. When the condition is advanced we see the classical picture described most graphically by Butlin—'the tongue looks as though it had been covered with white paint that had hardened, dried, and cracked'. Should the epithelium be shed over a considerable area a 'red glazed tongue' results. Leucoplakic plaques of long standing are so characteristic that they

---

\* *Leucoplakia*. Greek, λευκός = white + πλάζ = plate.



cannot possibly be mistaken, but frequent examinations must be made with a view to detecting the supervention of carcinoma (*Fig. 246*).

In early doubtful cases of leucoplakia press a glass slide on the surface of the tongue; viewed in this manner, plaques of thickened epithelium will appear more obvious. In advanced cases palpate each diseased area carefully; induration around one of these is sufficient to warrant the assumption that malignant change has occurred.



*Fig. 245.*—Palpating the root of the tongue.



*Fig. 246.*—Leucoplakia with three plaques of carcinoma.



*Fig. 247.*—Geographical tongue. Within two days the pattern changes.



*Fig. 248.*—Congenital fissuring of the tongue. The fissures are mainly transverse.

Early lesions must be distinguished from one, somewhat rare, condition.

*Lichen Planus* offers the only difficult problem in differential diagnosis. The lingual lesions of lichen planus are delicate and bluish white in colour; they look like mucous membrane to which silver nitrate has been applied. Lichen planus rarely occurs in the mouth alone; therefore when in doubt examine the flexor surfaces of the wrists and middle thirds of the shins for similar lesions.



*Geographical Tongue* (glossitis migrans) is symptomless. After an abdominal operation with peritonitis and antibiotic therapy, but occasionally idiopathically on the tongue of a child, spots, rings, and scallops appear (Fig. 247). The scallops, bright red in colour, and representing areas denuded of epithelium, are surrounded by a yellowish-white border (rings). So quickly does epithelial regeneration and fresh denudation occur that within one or two days the pattern imprinted on the dorsum of the tongue has changed. A cycle lasts about seven days with the idiopathic variety, but persists as long as the patient remains seriously ill with the secondary type.

*'Congenital' Fissuring of the Tongue* first appears towards the age of 3 or 4 years, and persists for life. As a rule there is a deepened median furrow and irregular folds occur in all directions, but the characteristic is that the main direction of the fissures is transverse (Fig. 248). These fissures, which are not deep, can be made more apparent by asking the patient to put the tip of the tongue on the floor of the mouth, and then to show as much of the top of the tongue as possible, viz. —————→

*Syphilitic Fissuring of the Tongue.*—In contradistinction to the above, the fissures are mainly longitudinal in direction (Fig. 249), and the intervening epithelial covering of the tongue is largely denuded.

*The Fissuring of Ariboflavinosis.*—Again the fissures are longitudinal in direction, and most of them are so deep as to justify the term 'crevice': the bottoms of the crevices are beefy-red (Afonsky). Usually the condition is associated with angular stomatitis (see p. 110).

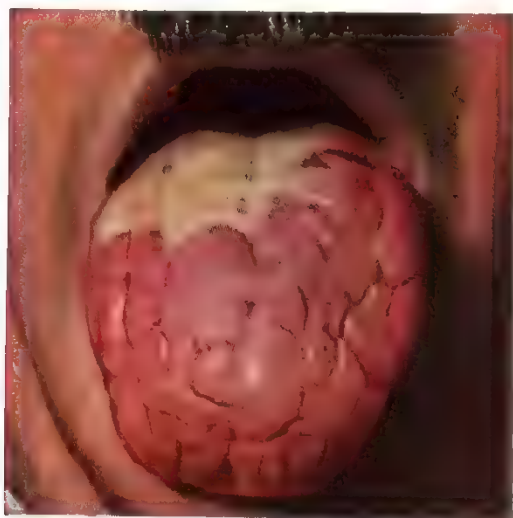
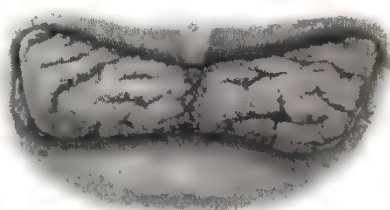


Fig. 249.—Syphilitic glossitis. The fissures are mainly longitudinal.

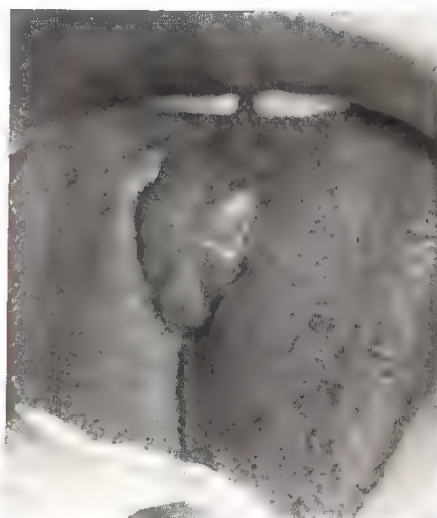


Fig. 250.—Median rhomboid 'glossitis'.

*Median Rhomboid 'Glossitis'* is characterized by a mass, ovoid or rhomboid in shape (probably the persistent tuberculum impar), situated in the midline posteriorly, immediately in front of the foramen caecum (Fig. 250). It is slightly raised, devoid of papillae, and is in distinct contrast to the adjacent normal surface of the tongue, from which it is separated by a well-defined edge. It is often diagnosed in the first instance as carcinoma. On palpation, the area is slightly indurated, and extends deeply into the lingual musculature.

*Lingual Thyroid.*—See p. 162.

*Haemangioma.*—The lesion, which may be either single or multiple, is present from a very early age, if not from birth. However, it tends to enlarge, and gives rise to symptoms only when traumatized. Blood-stained saliva is the usual symptom. These swellings (Fig. 251) are compressible, and when observed through a glass slide or a glass spatula while pressure is being applied, the blue colour disappears, but returns when the pressure is removed.

*Black or Hairy Tongue.*—Filiform papillary hypertrophy occurs at the back of the dorsum of the tongue. To the elongated papillae cling tiny brown or black particles that cause the affected

patch to assume an arresting furry appearance (Fig. 252): in all probability these particles are the cause of the hypertrophy. In about 60 per cent of cases the particles are found to contain a fungus or mould, notably the *Aspergillus niger*. The condition has increased in frequency with the increased incidence of buccal *Candida* infections consequent upon elimination of the normal bacteria of the mouth in patients undergoing antibiotic treatment.



Fig. 251.—Haemangioma of the tongue. The patient complained that her saliva was blood-stained.

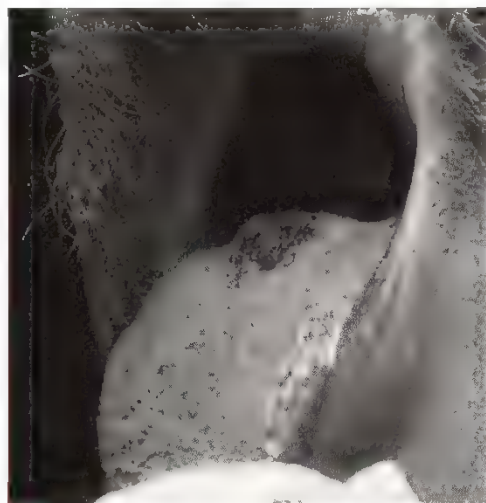


Fig. 252.—Black or hairy tongue.



Fig. 253.—Chronic dental ulcer.



Fig. 254.—Carcinoma of the tongue: ulcerating form.

**An Ulcer is Present on the Tongue.**—Before proceeding further, take a swab and dry the tongue thoroughly. The characters of the ulcer are then studied (*see* p. 35). Palpation of the tongue is done with a gloved finger, and whereas inspection is carried out with the tongue protruded, palpation is best performed with the tongue in, lest the contracted musculature simulates induration.

*Dental Ulcer* is precipitated by mechanical irritation, most commonly by a jagged tooth, but sometimes by a broken denture. In the acute stage, the ulcer, which is situated at the periphery or on the under surface of the tongue, is

elongated, often shows a slough as its base, and is surrounded by an area of erythema. In a more chronic state the slough lessens in amount, the edges of the ulcer become heaped (*Fig. 253*), and there is distinct induration of the surrounding tissues. The relevant opposing area must be palpated for a sharp edged tooth, or, if the patient wears a denture, this must be inspected carefully. Should the tissues about the ulcer still remain indurated for longer than a week after the cause has been removed, biopsy is indicated strongly.

*Carcinoma of the Tongue.*—This is the most common malignant neoplasm of the mouth, and, rightly, it is in the forefront of the mind of the clinician when a patient of middle age and over complains of a lesion of the tongue. The site of election for its development is on the sides, the base, and the under-surface: from the last situation it spreads to the floor of the mouth. True, the growth can commence as a wart or a nodule, but by far the most common presenting lesion is an ulcer which, by the time it is 1 cm. in diameter, has rolled, everted edges (*Fig. 254*).

To dry the ulcer with a swab, and to employ a magnifying glass to observe it, sometimes unveils this characteristic when mere inspection rendered it nebulous. Be that as it may, palpation remains the main pillar that supports the diagnosis. Are the immediate environs unmistakably indurated? If so, it is a carcinoma. That serological tests are positive for syphilis does not negate the diagnosis of carcinoma—lingual carcinoma can develop in the syphilitic.



*Fig. 255.*—Gumma of tongue.

It must be remembered that often lingual pain is referred to the ear, and patients with an advanced carcinoma of the tongue sometimes present themselves with a wad of cotton-wool in one ear, complaining solely of earache. The accepted explanation is that the lingual nerve has become involved and the pain is referred to the auriculotemporal nerve.

*Aphthous Ulcer of the tongue.*—See p. 112.

*Primary Chancre* is unusual on the tongue, but because it is unexpected in this situation, it may be misdiagnosed. It commences as a pustule, usually near the tip. This soon bursts, to form a small ulcer, and the surrounding tissue becomes indurated, but not so indurated as in the case of a penile primary chancre. As in chancre of the lip (*see Fig. 83*, p. 38), the submental and sub-mandibular lymph-nodes become enlarged, often grossly.

*Gumma of the Tongue.*—Before it breaks down and becomes an ulcer, a lingual gumma shares with gummata elsewhere the property of providing a perplexing problem. However, that the mass thus produced is situated in the midline of the anterior two-thirds of the tongue, and is painless, helps to elucidate the diagnosis, which a serological test and, if that test be positive, a trial of antisyphilitic treatment will substantiate. On the other hand, when an ulcer forms, the characteristic 'punched-out' appearance (*Fig. 255*), the relatively small amount of surrounding induration, and above all the absence of pain, should clarify the diagnosis.

*Chronic Non-specific Ulcer of the Tongue* usually is situated on the forepart of the tongue (*Fig. 256*). It is an ulcer of negations. It is *not* very painful, there is *no* history of trauma, there is *no* sharp tooth to cause the lesion, there is *no* evidence of tuberculosis or syphilis, and only moderate induration is present. Without a biopsy it is likely to be diagnosed as a carcinoma.

*Tuberculous Ulcer of the Tongue* is now rare and usually, but not necessarily, complicates



advanced untreated pulmonary or laryngeal tuberculosis. It is almost always situated on the tip or the sides of the anterior third, often multiple (*Fig. 257*), and nearly always gives rise to severe pain with impairment of mastication and articulation. The base is covered with pale granulations, and if the ulcer is large enough, the fact that its edges are slightly overhanging often can be discerned. The lingual lesions of tuberculosis are so protean\* that when an unusual nodule or ulcer presents, especially if painful, tuberculosis should be suspected.

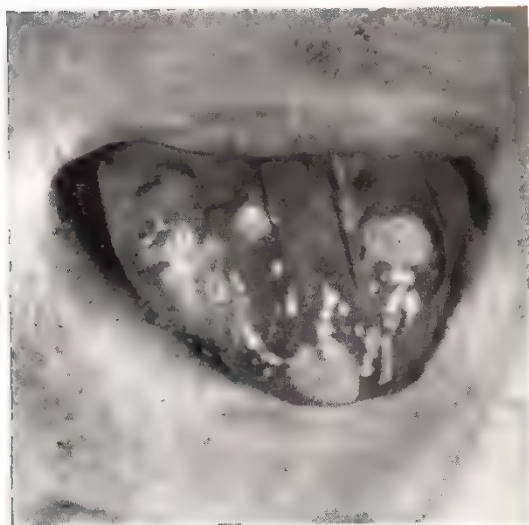


*Fig. 256.*—Chronic non-specific ulcer of the tongue.

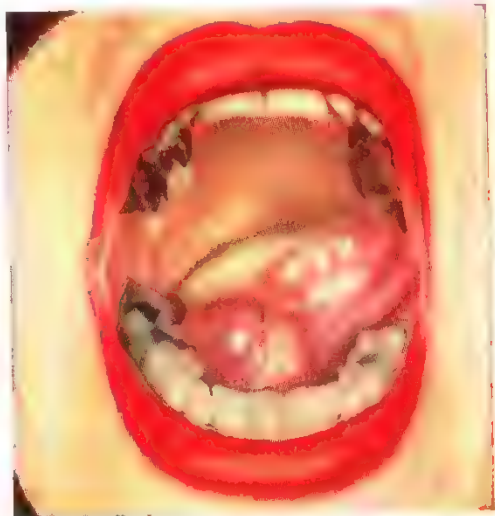
### EXAMINATION OF THE FLOOR OF THE MOUTH

Ask the patient to put the tip of the tongue on the roof of the mouth and to bend the head slightly backward.

A *Ranula*† can be recognized at once as an



*Fig. 257.*—Tuberculous ulcers of the tongue.



*Fig. 258.*—A ranula is invariably translucent.

obviously translucent cystic swelling, often of a bluish tinge, situated on one side of the fraenum lingulae (*Fig. 258*), although on occasions, having filled the floor of the mouth on one side, it extends beneath the fraenum to the opposite side. Often the submandibular duct can be seen traversing the dome of the cyst. Ranulae occasionally extend into the neck: therefore palpate the submandibular triangle carefully from without for an extension of the swelling, and complete the examination by a bidigital palpation with the index finger of one hand in the mouth and fingers of the other hand exerting upward pressure from below the lower jaw.

A *Sublingual Dermoid Cyst* can be either median (*Fig. 259*) or lateral, and either above or below the mylohyoid. When above the mylohyoid, the opaque white cyst is discernible through the normal mucous membrane; as it contains sebaceous material its opacity differs completely from the translucency of a ranula. In all cases the neck must be examined, and the swelling palpated bimanually (*see Fig. 214*, p. 106). Should the cyst be median and below the mylohyoid, consider its possible relationship to the thyroglossal tract (*see p. 164*).

\* *Protean*. Proteus, sea-god, fabled with the power to change into an endless variety of forms.

† So named by Hippocrates, who likened this swelling to the belly of a little frog.

*Carcinoma of the Floor of the Mouth.*—Frequently the lesion is discovered by the patient himself who, with the tip of his tongue, feels that there is something on the floor of the mouth. As the growth extends, it invades the fraenum, with the result that pain is experienced on movement of the tongue. Carcinoma of the floor of the

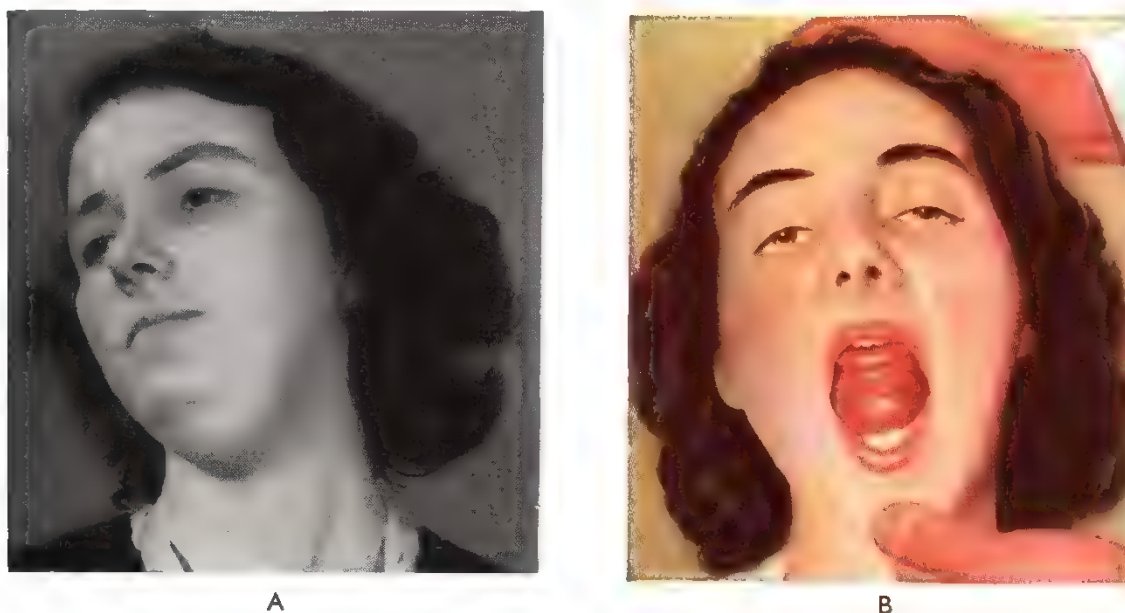


Fig. 259.—Median sublingual dermoid cyst. **A.** The swelling beneath the chin; **B.** The swelling in the floor of the mouth.

mouth invades the lymphatics early, and spreads from the submandibular nodes to the deep cervical nodes. Untreated, it is not long before the mandible is invaded. The ulcerative form is particularly prone to become infected, often with Vincent's organisms; sometimes on culture of mucus from an ulcer on the floor of the mouth these organisms predominate, and diagnosis is delayed in the belief that the lesion is entirely inflammatory. Once again an *indurated* ulcer in this region is almost certainly carcinomatous.

#### EXAMINATION OF THE MUCOSA OF THE CHEEK

The angle of the mouth is retracted, and the interior is illuminated with a torch.

*Pigmented Patches.*—Frequently in Addison's disease, and occasionally in Peutz-Jeghers syndrome (see p. 110), the mucous membrane is dappled brown.

*Apthous Ulcer* (see p. 112).—A favourite site for such an ulcer is opposite the first molar tooth.

*Leucoplakia.*—Although it attacks the cheek less often than the tongue, leucoplakia is by no means rare in the former situation (Fig. 260). Sometimes the cheek is thus affected and the tongue is not.

*Mucous Cyst.*—This is a somewhat common location for such a cyst (see p. 112).

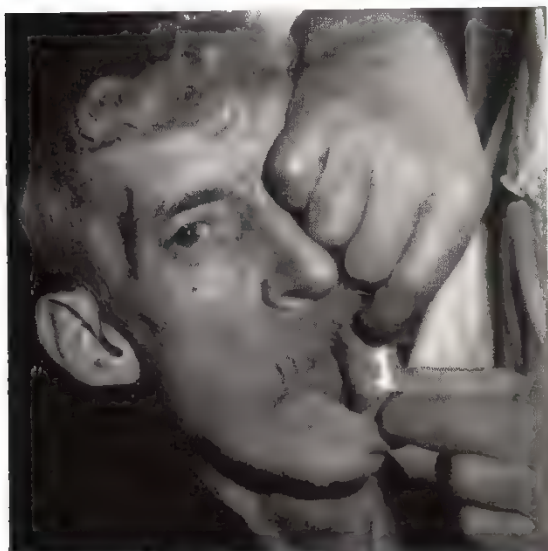
*Papilloma* (Fig. 261) is frequently encountered on the mucous lining of the cheek.

*Carcinoma* of the cheek is less common than when quids of tobacco were chewed and pouched in the cheek, but it is still rife in those tropical countries where the inhabitants are addicted to betel-nut\* chewing.

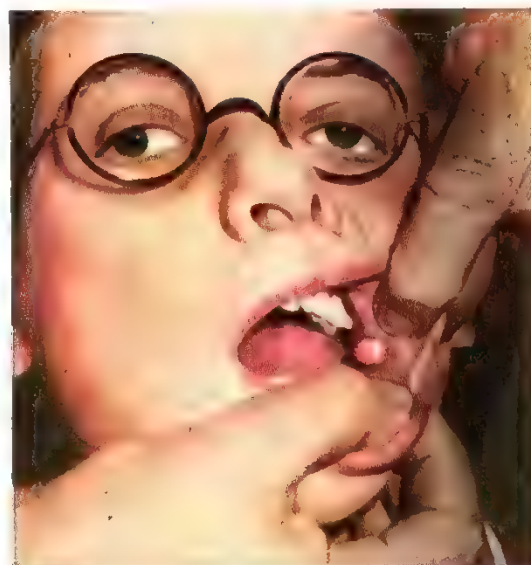
\* *Betel-nut* = a few grains of the nut of the catechu palm rolled up in a leaf with quick-lime.



Further particulars of the methods to be employed in examining the cheek will be found on pp. 91 (swelling in the cheek), 101, and 103 (parotid duct).



*Fig. 260.* Leucoplakia of the cheek.



*Fig. 261.—*Papilloma of the cheek.

### EXAMINATION OF THE PALATE

The palatal rugae are five or six transverse ridges that are present on the hard palate. They vary in prominence in different individuals. Well developed in the newborn, no doubt to assist in sucking, as age advances they become flatter.



*Fig. 262.—*A hole in the palate due to syphilis. This cause is now a rarity.



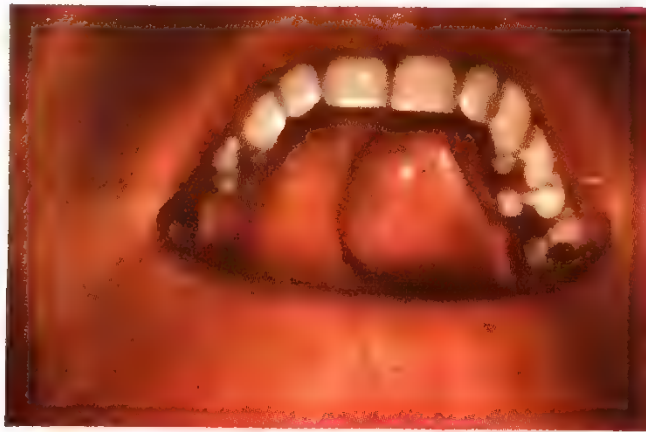
*Fig. 263.—*Carcinoma of the palate.

Inspection of the palate is one of the very few occasions when physical examination is facilitated by an infant crying. The more the child cries the better the view obtained. If a cleft is present determine its extent, whether it involves the hard or the soft palate, or both. That the more mature patient has a hole or cleft in the palate can be suspected when he addresses you in that peculiar explosive nasal voice which accompanies a leakage of the sound waves into the nasal cavity.

**Inspection of Palate.**—Ask the patient to tilt his head slightly backwards and to open his mouth to its fullest extent. If the light is good, the whole of the palate

can be observed, and any abnormality detected at once. Then ask him to say 'Ah'. Loss of movement of half the soft palate suggests a lesion of the vagus nerve (*see* p. 60) or an infiltrating neoplasm of the nasopharynx (*see* p. 133). Paralysis of the whole soft palate is found in the bulbar form of poliomyelitis. Normal movement of the whole soft palate facilitates visualization of the tonsils (*see* p. 130). The hard palate forms the inferior surface of the maxilla (*see* p. 94).

*A Hole in the Middle of the Soft Palate* (*Fig. 262*) is presumptive evidence of previous syphilis (gumma). However, it is unwise to jump to a conclusion; when an operation for closure of a cleft palate has been only partially successful, a hole may be left in the middle line at the junction of the hard and the soft palate, and this is probably now a commoner cause than syphilis. Necrosis resulting from radiotherapy for a carcinoma in this region is also a cause.



*Fig. 264.*—Mixed tumour of an ectopic palatal salivary gland.

*A Carcinoma* can arise in the epithelium of the hard palate (*Fig. 263*) or the soft palate. The inability to wear an upper denture is sometimes the first symptom of this neoplasm.

*Tumour of an Ectopic Salivary Gland.*—The palate is the most frequent site, but these tumours may be found anywhere in the mouth or pharynx and even in the bronchi. In the beginning the tumour is symptomless and is noticed accidentally, but when ulceration occurs it becomes painful. A large proportion of these tumours are of low-grade malignancy (cylindroma) and may ultimately metastasize to the regional lymph-nodes, the viscera, and the skeleton (Harrison). Locally, it may invade the base of the skull and implicate certain cranial nerves, causing severe pain in the distribution of the nerve or nerves involved. Mixed tumours also occur (*Fig. 264*).

*Cyst of the Palate.*—A palatal mucous gland occasionally gives rise to a cyst similar to a cyst of other buccal mucous glands. Unless translucent, it is unsafe to assume this diagnosis.

*Palatal Abscess.*—*See* pp. 119, 132.

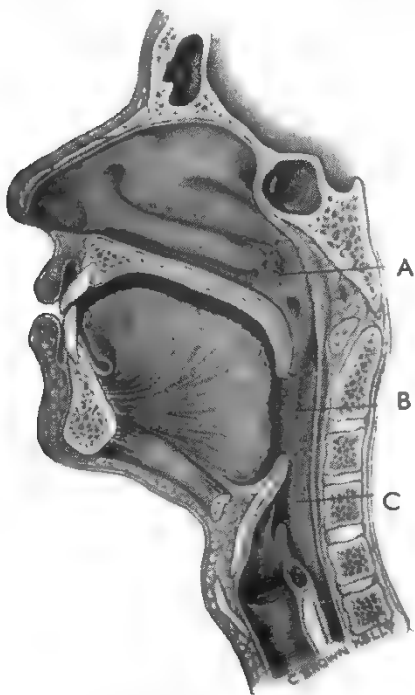
## CHAPTER XII

## THE THROAT, NOSE, AND NASAL SINUSES

CONTRARY to what is believed by many, much of this territory is available for clinical examination, and provided the clinician knows what to seek, and employs the correct method of seeking it, often he will be enabled to make a confident, or at least an intelligent tentative, diagnosis without the aid of specialized methods of examination.

When examination by speculum, laryngeal or postnasal mirror, or X-rays is imperative, the necessity will be indicated, but details of such procedures and the resulting findings are beyond the scope of this work.

**Surgical Anatomy** is shown in *Figs. 265 and 274*.



*Fig. 265.*—The component parts of the pharynx which, in the adult, is 13 cm. in length: (A) Nasopharynx, into the lateral wall of which open the Eustachian tubes above which are the pharyngeal recesses (fossa of Rosenmüller); (B) Oropharynx; (C) Hypopharynx, which continues into the oesophagus at the level of C.6 vertebra.

## THE OROPHARYNX AND THE NASOPHARYNX

**Examination of the (Palatine) Tonsils.**—The tongue is depressed with a spatula, and, while the patient says 'Ah', the tonsils are inspected with the aid of a torch. To decide whether the tonsils (absent in the newborn) are normal in size and healthy or enlarged and/or diseased, it is necessary for them to be displayed. The best method is to depress the tongue with one spatula while the tip of a second spatula gently compresses the anterior pillar of the fauces (*Fig. 266*). This everts the tonsil from its bed. Increasing pressure will expose and open the crypts, and their content may be discharged (Moore). Pus (yellow) signifies inflammation; a whitish discharge may be normal.

With the advent of puberty, lymphoid tissue diminishes, and the tonsils become smaller. Following recurrent attacks of tonsillitis the tonsillar lymph-node (*see Fig. 283*, p. 140) is frequently palpable. Enlarged tonsils are not necessarily infected. Excessive hypertrophy is often bilateral. Occasionally the tonsils are so large that they almost meet in the midline.

**Carcinoma of the Tonsil.**—As a rule the patient is elderly, and severe pain radiating to the ear is frequently the chief complaint. The breath is foul and often the saliva is blood-stained: more severe haemorrhage is not unusual. Usually carcinoma takes the form of an ulcer, direct palpation of which reveals characteristic induration. The tonsillar and other neighbouring lymph-nodes become involved early.

**Lymphosarcoma of the Tonsil.**—The patient is usually younger and the complaint is a lump in the throat, which, in the early stages, is quite painless. Thick speech is a common symptom. The tonsil appears large and pale and may mimic a peritonsillar abscess. Once the capsule of the tonsil has become eroded by the growth, extra-capsular extension proceeds apace, and a palpable, and later visible, swelling occupies a characteristic position immediately behind and below the angle of the mandible. On this account, in spite of the fact that the cervical nodes soon become involved, a swelling in this position is likely to be an extension of the primary growth.

**Adenoids.**—The 'pharyngeal tonsil' is present at birth, persists throughout infancy and childhood, and undergoes atrophy at puberty. Remnants of this structure, so well marked in the very young, commonly persist into early adult



Fig. 266.—By pressure against the anterior pillar of the fauces an apparently small buried tonsil may be everted from its bed. At the same time crypts are opened and their contents squeezed out. (After Moore.)



Fig. 267.—Palpating the nasopharynx for adenoids.

life. Adenoids consist of hypertrophy of this structure. When pronounced, they form clusters of dangling 'vegetations'. Reference has been made already to the so-called 'adenoid facies' (see p. 89). Considerable adenoid hypertrophy causes the patient to snore loudly at night and to breathe through the mouth.

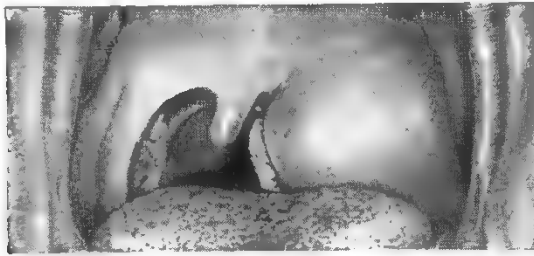
A reliable method of palpating the nasopharynx is shown in Fig. 267. Standing behind the seated patient (an infant is sat upon a nurse's lap) the index finger is passed into the mouth, and hooked around the posterior border of the soft palate. Swiftly, the pulp of the finger near the tip is swept over the roof and walls of the nasopharynx. The precaution to prevent the examiner's finger being bitten which has been described on p. 121, and is to be seen in Figs. 267 and 245, must be taken.

Alternatively, should the presence of adenoids be highly probable by reason of mouth-breathing, nasal speech, nasal discharge, enlarged cervical lymph-nodes, or recurrent attacks of deafness during head colds, rather than subject a young child to the psychological trauma of palpation of the nasopharynx, often it is advisable to postpone such palpation until the patient has been anaesthetized, and proceed to remove the adenoids and, if need be, the tonsils, at that time. The objection to palpation of the nasopharynx of a child does not appertain with an infant.

**Peritonsillar Abscess (Quinsy).**—The patient enters the consulting room with a handkerchief in his hand and the head held forwards and upwards. He talks



as though he has a hot potato in his mouth, and makes frequent, painful swallowing movements (Ovens). When asked where the pain is, the patient usually points to the region of the tonsillar lymph-node (*see* p. 140). Some degree of trismus may make the examination difficult. Usually the abscess lies mainly in front of the corresponding faucial tonsil (*Fig. 268*). The soft palate on that side is bulging and oedematous.



*Fig. 268.*—Peritonsillar abscess.

It is important not to be deceived by the fact that while the temperature frequently is over  $39^{\circ}\text{C}$ . during an attack of acute tonsillitis, by the time pus has burst into the peritonsillar space, rarely is the temperature much above normal.

A *posterior variety* of peritonsillar abscess pushes the tonsil forwards, the abscess being concealed partially thereby.

**Retropharyngeal Abscess** is of two varieties—acute and chronic. The former, sometimes being an immediate menace to life, calls for urgent and precise diagnosis as a prelude to drainage without delay.

*Acute Retropharyngeal Abscess* is caused by suppuration within, and breakdown of, one or more of the lymph-nodes that normally occupy the retropharyngeal space. The patient is often, but not necessarily, an infant. The apex of the abscess is opposite the glottis and interference with deglutition and respiration is caused. In order to maintain an adequate airway a child will hold its head in full extension with its mouth open—a position that is practically pathognomonic. The temperature is usually greatly raised. Note that the retropharyngeal space, which is a fascial space sandwiched between the pharynx in front and the prevertebral fascia behind, is divided completely in the midline by a strong fascial septum into a right and a left compartment; consequently the swelling of an acute retropharyngeal abscess is *always on one side of the midline*. Sometimes the abscess can be seen by depressing the tongue; it can always be felt (*Fig. 269*) as an indentable, cushion-like projection if the finger is introduced into the mouth to allow the tip of the digit to impinge upon the swelling.

**Chronic Retropharyngeal Abscess.**—With the decline in the incidence of tuberculosis, chronic retropharyngeal abscess arising from a cervical vertebra is encountered rarely, although it is commoner in those parts of the world where the population has low resistance to tuberculosis. Such an abscess lies *behind* the prevertebral fascia, and consequently occupies the midline. In this instance the symptoms of the abscess are slight compared with those of the cervical caries (*see* p. 153). Cases of chronic retropharyngeal abscess due to tuberculous retropharyngeal lymph-nodes are commoner. In this instance the pus lies *in front of* the prevertebral fascia in the retropharyngeal space, and is likely to occupy the right or the left compartment as does an acute abscess, and gives rise to a unilateral swelling which, as it enlarges, causes a fullness in the neck behind the



*Fig. 269.*—Palpating an acute retropharyngeal abscess in an infant.

sternomastoid muscle. This outward swelling, rather than difficulty in swallowing or in breathing, first calls attention to this type of chronic abscess. The abscess can also be seen as well as felt at the back of the pharynx.

**Neoplasms of the Nasopharynx.** *Carcinoma:* In the Far East carcinoma and other malignant growths of the nasopharynx are more common than malignant disease in any part of the body save the cervix uteri. Fifty per cent of malignant growths of the nasopharynx arise in its lateral wall, mostly in the fossa of Rosenmüller. The remainder are divided equally between the roof and the posterior wall.

A patient with a carcinoma of the nasopharynx presents with some of the following: (1) Slight intermittent epistaxis; (2) Pain in the ear, and not infrequently other signs of middle-ear disease due to blockage of the Eustachian tube; (3) Loss of movement of the soft palate on the affected side due to infiltration by the growth; (4) A mass in the neck (metastases in the cervical lymph-nodes); (5) Cranial nerve involvement due to implication of one or more cranial nerves at the base of the skull (*see Fig. 298, p. 146*); (6) Proptosis (*see p. 77*), due to lateral extension of the growth into the orbit, is rare.

The extremely poor prognosis of the condition is due, in part, to the lack of symptoms until late, but there is no gainsaying that in a number of instances late diagnosis is the result of perfunctory examination by the clinician to whom the patient first reported. Attention is again directed to the method of digital examination of this inaccessible region, as described and illustrated on p. 131.

*Angiofibroma of the Nasopharynx* (Juvenile Nasopharyngeal Fibroma) is almost confined to male patients about the age of puberty, and when a boy presents with progressive nasal obstruction, recurrent epistaxis, a purulent nasal discharge, and on palpation of the nasopharynx, as for adenoids, a firm bosselated mass occluding the choanae\* is felt, the diagnosis is certain. Visualization of the postnasal space with a mirror is necessary for confirmation and will reveal a reddish, firm tumour covered with normal mucous membrane.

### THE HYPOPHARYNX

**Carcinoma of the Hypopharynx.**—That hoarseness not obviously improving after more than a week calls for examination with a laryngoscope is axiomatic. Only in 20 per cent of cases is the first symptom of a carcinoma of the hypopharynx vocal in nature.

*Carcinoma of the Piriform Fossa.*—In a high proportion of cases a neoplasm commences in a part of the hypopharynx removed from the vocal cords, i.e., the piriform fossa, where it is notoriously silent, and often the first intimation is an enlarged lymph-node behind the angle of the jaw. However, from time to time a patient presents on account of difficulty in swallowing saliva as opposed to food. Carcinoma of the hypopharynx is beyond the reach of digital detection. Examination with the laryngeal mirror is the key to its elucidation.

*Postericoid Carcinoma.*—Attention is directed to the frequency with which neglected cases of sideropaenic dysphagia (*see p. 134*) result in a carcinoma here.

*A Late Sign in Growths of the Hypopharynx.*—The larynx is normally mobile from side to side. When a growth has infiltrated the prevertebral fascia this mobility is reduced or absent.

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\* *Choanae* (posterior nares). Greek, *χοάνη* — a funnel.

### THE LARYNX

Hoarseness or loss of voice is the presenting symptom of diseases of the vocal cords. Ordinary clinical examination is of no value with the exception of a search for enlarged lymph-nodes. These are involved relatively late in carcinoma of the cords. Examination with the laryngeal mirror is the essential method of examination.

*Laryngeal Fractures* are seen increasingly with serious car accidents. Other severe injuries tend to mask the following salient features (due to fractures of the thyroid cartilage and hyoid bone and detachment of the vocal cords):—(1) loss of voice (2) local pain (3) respiratory obstruction causing stridor (*see* p. 183) (4) subcutaneous emphysema (*see* p. 16).



Fig. 270.—Bilateral haematoma of the nasal septum following a blow on the nose.

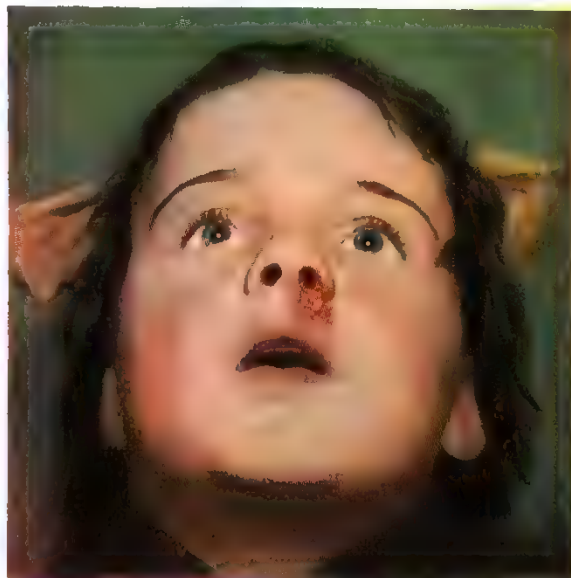


Fig. 271.—Unilateral excoriated nostril due to discharge resulting from a foreign body in the nose.

### THE NOSE

A useful sign which may be present in most of the conditions described below, but particularly in *deviated nasal septum*, is elicited by asking the patient to exhale through the nose while the naris is occluded by finger pressure on the ala nasae, each side being tested in turn. Normally there is free and equal egress of air through each nasal passage.

Particularly in children a better view of the nasal cavities is obtained by tilting the patient's head back and elevating the tip of the nose with the thumb (*Fig. 270*).

**Snuffles** is a term reserved for a mucopurulent discharge from one or, more usually, both nostrils occurring in infants as a stringy, tenacious snot that travels in and out of the nares during inspiration and expiration, causing a characteristic noise. Formerly when congenital syphilis was rife it was often due to necrosis of the nasal septum but is now commonly associated with enlarged adenoids, and calls for digital examination of the nasopharynx.

**Nasal Choanal Atresia.**—*See* p. 88.

**Fracture of the Nasal Bones** probably occurs more often than any other fracture, except those of the wrist and the clavicle. Any blow upon the nose that

causes bleeding from the nose may signify that the bone or cartilage has been broken or displaced. There are two types:—

1. *Depressed Fracture* due to a blow from in front causing one, or, more usually, both nasal bones to be displaced downwards and inwards. As a haematoma often conceals the depression, both inspection and gentle palpation may fail to detect that the nasal bones have been driven inwards.

2. *Lateral Fracture*.—One nasal bone is driven inwards and the other outwards, the nasal septum being involved. That the nose is crooked is sometimes manifest; at other times it requires more careful scrutiny.



Fig. 272.—Rhinophyma.



Fig. 273.—Midline granuloma.

A copious fluid discharge, too thin to be pure blood, suggests a fracture of the cribriform plate of the ethmoid with leakage of cerebrospinal fluid. A sharp lookout should be kept as to whether the blood issuing from the nose is diluted.

**Haematoma of the Nasal Septum.**—A collection of blood beneath the mucoperichondrium is commonly due to injury: exceptionally it arises spontaneously, or after trauma so slight as to be unascertainable, in which event the question of defective coagulation of the blood, e.g., haemophilia, arises. As a rule, the patient complains of headache. The mouth is held slightly open, the nostrils are splayed, and the anterior end of the nose is widened. Frequently, in cases where there is considerable extravasation of blood, the skin over the tip of the nose is pale from stretching, and there is loss of sensation in this area, due to pressure on the anterior ethmoidal nerve. The haematoma is commonly bilateral (Fig. 270). The mucoperichondrium is very strong, and blood and pus can be locked in the septal sac for weeks, in which case the nasal cartilage, deprived of its main blood-supply and dependent almost entirely upon the haematoma for its nutrition, undergoes slow necrosis. Should the haematoma become infected, pyrexia and increased headache follow.

**Foreign Body in the Nose.**—When a child is brought by a parent on account of a purulent nasal discharge, and that discharge is found to be unilateral (Fig. 271), the first thing that should spring to mind is, 'Is there a foreign body in the affected nasal passage?' Simple inspection and use of the nasal speculum will usually settle this point.

**Rhinophyma.**—Dubbed by the ignorant 'bottle-nose', it is due to multiple sebaceous adenomata of the skin that covers the distal half or two-thirds (Fig. 272).



**Midline Granuloma of the Nose.**—The course of this, fortunately rare, disease is divided into three stages: prodromal, active, and terminal. The first stage is extremely insidious and is characterized by a minor degree of nasal obstruction, usually unilateral, later associated with a watery nasal discharge: eventually the discharge becomes blood-stained, and causes the patient to seek advice. During the second stage the obstruction increases, the discharge becomes foul, and granulation tissue can be seen in the nasal passages. Spreading cellulitis of the face supervenes (*Fig. 273*): there is no pain. Sooner or later intranasal ulceration ensues, progresses, and results in widespread necrosis of the nasal skeleton and the walls of the accessory nasal sinuses. Untreated, if the patient survives long enough, the whole face between the eyes and the mandible becomes destroyed.

**The Saddle-nose of Syphilis** (*see p. 88*).

**New Growths of the Nasal Vestibule.** Being lined by skin it is liable to the neoplasms mentioned on p. 36 and malignant melanoma (*see p. 24*). Basal-cell carcinoma is the commonest.

### THE ACCESSORY NASAL SINUSES

As shown in *Fig. 274*, the accessory nasal sinuses accessible for clinical examination are the frontal, ethmoidal, and maxillary. The area of maximum tenderness



*Fig. 274.*—Surface markings of (1) frontal, (2) ethmoidal, (3) maxillary sinuses. The black areas show where to palpate for tenderness on the cutaneous surface; white area, where to palpate from inside the mouth.



*Fig. 275.*—Eliciting tenderness over the floor of the frontal sinus.

for each is depicted. A unilateral purulent nasal discharge (if a foreign body (*p. 135*) is excluded) indicates suppuration or neoplasm of one of the sinuses.

**Acute Frontal Sinusitis.**—The majority of sufferers are under 21 years of age. The usual antecedent history is that in the course of a heavy cold the patient develops malaise, some elevation of temperature, and pain located over the sinus. Diving, and especially plunging feet first into water from a height, are also well-known initiating causes. Usually the localized headache commences one or two hours after rising, increases in severity towards noon, and diminishes in the middle of the afternoon; sometimes it radiates to the temporal area.

Tenderness over the affected sinus (*Fig. 274*) may be present, especially if free drainage is obstructed. To elicit tenderness the finger-tip must be insinuated

beneath the roof of the orbit towards the medial extremity of the sinus, and pressure directed upwards (*Fig. 275*) (Ballenger).

So long as drainage can occur along the duct the symptoms remain comparatively mild; should drainage cease, often a rapid, progressive, fulminating inflammation sets in, and is heralded by an exacerbation of the general symptoms, together with oedema of the eyelids of the affected side (*Fig. 276*). Unless efficient treatment is instituted, serious complications may follow. These include orbital cellulitis (*see p. 70*), osteomyelitis of the frontal bone (*see p. 56*), extradural abscess, subdural abscess, meningitis, brain abscess, and sagittal sinus thrombosis. A combination of acute frontal sinusitis and ethmoiditis is common.

**Acute Suppurative Ethmoiditis** *per se* is comparatively rare. Sinusitis in infants and young children is largely confined to the ethmoid, the only sinus well developed early in life. As a rule one of the acute infectious diseases, such as scarlet fever or measles, precedes its onset. The constitutional signs are slight pyrexia, sometimes accompanied by mild toxæmia. Swelling of the eyelids on the affected side occurs early and regularly. The symptoms include headache with pain radiating to the back of the eye. Unilateral nasal obstruction with anosmia is present, with tenderness over the eyeball.

In order to elicit tenderness over the ethmoidal cell labyrinth, pressure should be directed over the area indicated in *Fig. 274* (2).

**Chronic Frontal Sinusitis** is occasionally a cause of obscure headache, the unilateral character of which is liable to be mistaken for migraine.

**Acute Maxillary Sinusitis.**—As the maxillary antrum does not attain full development until the twelfth year, serious infections of this cavity are more likely to occur in patients past that age. Like frontal sinusitis, the most usual precursor is the common cold, but less frequent causes are infection due to extension from an apical dental abscess or as the result of perforation of the floor of the antrum during extraction of an infected tooth.

The constitutional symptoms are often severe, especially when the pus is confined by occlusion of the natural ostium. Dull throbbing pain in the cheek, and in the upper teeth when the patient stoops, is characteristic. Commonly the patient considers that he is suffering from toothache, and visits a dental surgeon. Frequently the affected side of the face is swollen and the lower eyelid is somewhat oedematous. Breathing through the nostril on the side of the lesion is impaired, and often obstructed completely. Not until the third or fourth day of the attack is a unilateral purulent discharge much in evidence. Local tenderness over the antrum is an important sign. Clinical examination should be supplemented by transillumination of the antrum (*Figs. 277, 278*), but this is much less reliable than radiography.

**The Differentiation of a Rapidly Growing Neoplasm from Inflammation.**—Several demonstrations of extreme activity of a malignant growth giving rise to local redness and increased local temperature have been described in this book. Here is a poignant example. Two patients presented, one with inflammation over the maxillary sinus (*Fig. 279*) and the other with a rapidly



*Fig. 276.*—Oedema of the lids of the left eye secondary to acute frontal sinusitis with ethmoiditis.

growing neoplasm in the same situation (*Fig. 280*). In the latter case there was neither tenderness nor softening over the swelling. The former's temperature was elevated.



*Fig. 277.*—Dark-room transillumination of the maxillary sinus. In this case the left side fails to illuminate, and suggests an infected sinus. Remember to remove an upper dental plate before attempting the test.



*Fig. 278.*—In ordinary clinical practice transillumination by this method is more serviceable. It can be carried out effectively in a *darkened* room. Test first one side, then the other and compare illumination as seen through the palate.



*Fig. 279.*—Periostitis of the right maxilla with involvement of the subcutis.



*Fig. 280.*—Sarcoma of the left maxilla.

**Chronic Maxillary Sinusitis.**—The essential features are a long-continued unilateral nasal discharge, local tenderness, and pain. Rhinoscopy is essential, for so often the condition is associated with nasal polypi. Transillumination and X-rays are necessary to establish the diagnosis.

**Neoplasms of the Accessory Air Sinuses.**—The maxillary and ethmoidal sinuses are affected, never the frontal. At first the symptoms suggest chronic sinusitis with identical clinical findings. Later local swelling occurs (*see Examination of the Maxilla*, p. 93) and epiphora (*see p. 73*). Upward displacement of the eye (maxillary tumours) or lateral displacement (ethmoid tumours) is a late sign.

## CHAPTER XIII

## THE NECK (EXCLUDING THE THYROID GLAND)

WHEN the neck is to be examined all clothing is removed as far as the axillae, which allows the whole neck to be seen in relationship to the thorax and permits inspection and palpation of the supraclavicular fossae. When enlarged lymph-nodes are found it is often necessary to examine the breasts adequately.

## EXAMINATION OF THE LATERAL REGIONS OF THE NECK

The key to the lateral region of the neck is the sternomastoid muscle. Bearings are taken from this structure, first with the eye and then with the fingers.



Fig. 281.—Torticollis, often the sequel of a neglected sternomastoid 'tumour' of infancy.



Fig. 282.—Determining the relationship of a cervical swelling to the sternomastoid.

*Sternomastoid 'Tumour'.*—If there is a swelling obviously *in* the sternomastoid muscle, and the patient is an infant (who has usually undergone breech delivery), it is an example of the so-called sternomastoid 'tumour'.

*Torticollis (Wry-neck).*—When one sternomastoid is tense and the head is held, even slightly, on one side, ask the patient to try to straighten the neck: if the case be one of torticollis (Fig. 281) he or she cannot do so, but with the attempt the sternomastoid, especially its sternal head, stands out.

Particularly in the case of a child, it is important to differentiate *ocular torticollis* due to a squint (usually involving one of the rotatory muscles of the eyeball) from a wry-neck due to shortening of one sternomastoid. The examiner clasps the head, and slowly straightens it, at the same time watching the patient's eyes. In ocular torticollis, on straightening the head a squint will become apparent.

In congenital torticollis (i.e., presenting in infancy) one-third are found to be associated with sternomastoid tumour (*see above*) and two-thirds are due to an



abnormal position *in utero*, no 'tumour' being found. This variety recovers spontaneously in a few weeks (Hulbert).

In any case of torticollis of long standing, study the face critically; the features on the affected side will be seen to be, perhaps very slightly, less well developed than those of the opposite side.

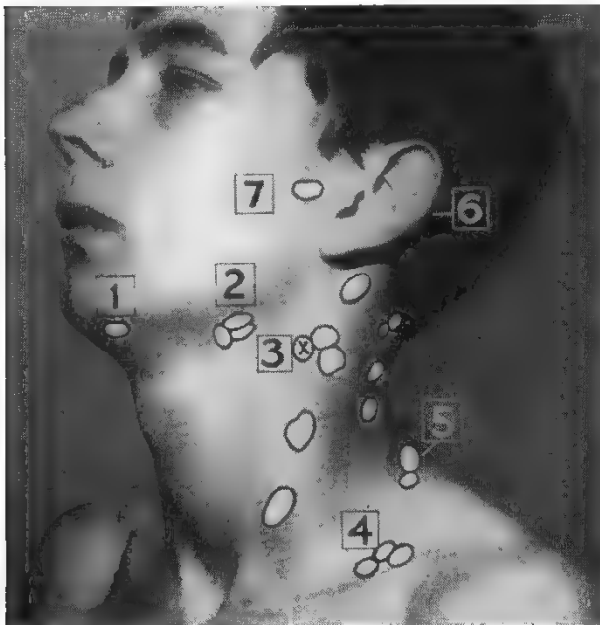
Asymmetry of the skull can be detected by examining the head and neck from behind—the scoliosis capitis of Middleton.

**Determining the Relationship of a Cervical Swelling to the Sternomastoid.**—Commonly, when it flanks a lateral cervical swelling the sternomastoid muscle becomes thin and flattened out; consequently, more often than not, by mere palpation it is impossible to determine the relationship of the swelling to the sternomastoid unless the muscle is rendered taut.

Stand behind the patient. Ask him to push his chin as hard as possible against the palm of your hand (*Fig. 282*). This makes the sternomastoid tense. With the other hand palpate the sternomastoid from below (where it is normal) upwards, paying special attention to the anterior border.

### PALPATION OF THE CERVICAL LYMPH-NODES

Always conduct this examination from behind. In order that no lymph-node shall be overlooked, it is well to have a routine that scrutinizes every group. *Fig. 283* shows a useful order.



*Fig. 283.*—Order in which various groups of cervical lymph-nodes are best palpated: (1) Submental; (2) Submandibular; (3) Jugular chain; (4) Supraclavicular; (5) Posterior triangle; (6) Postauricular; (7) Pre-auricular. The node marked X is the tonsillar (juglodigastric) lymph-node.



*Fig. 284.*—Palpating the submandibular group of cervical lymph-nodes. The hand on the head enables the clinician to adjust the degree of flexion.

instance a second method of examination becomes necessary in some cases (*Fig. 286*).

The lymph-nodes of the posterior triangle consist of scattered nodes in the main part of this large triangle; there is also a small group of nodes situated in the apex

The submandibular nodes are rendered more easily palpable by flexion of the head (*Fig. 284*). This manœuvre is also of value in examining the supraclavicular nodes (*Fig. 285*), but in this

of the triangle, and known as the suboccipital group, but attention is drawn especially to the chain of lymph-nodes lying along the posterior border of the sternomastoid muscle, enlargement of which can be seen in *Fig. 110*, p. 54.

If any of the cervical lymph-nodes are found to be enlarged the possible sources of infection or of a primary growth are examined next—scalp, tongue, mouth, tonsil, ear, etc.—and particular attention is paid to the area drained by those found to be diseased (e.g., if the posterior triangle and/or posterior auricular region contain enlarged nodes, the scalp must be examined with scrupulous care). The supraclavicular nodes, particularly on the left side, may be enlarged with carcinoma of the stomach (sign of Troisier) or of any other abdominal organ, and, increasingly, with carcinoma of the bronchus.



*Fig. 285.*—Palpating the left supraclavicular fossa from in front. If the examination is negative, in certain cases it is necessary to rise, stand behind the patient, and carry out palpation from behind.



*Fig. 286.*—Palpation of the supraclavicular fossa from behind, with the patient elevating and hunching forward his shoulders.

### DIFFERENTIAL DIAGNOSIS OF A SOLID SWELLING OF THE NECK

**Tuberculous Lymph-nodes.**—Except in populations with low immunity (e.g., the Indian sub-continent; people of African descent) this condition has become distinctly uncommon. The tonsillar node (*Fig. 289*) is often the first to become enlarged. This subject is dealt with more fully on p. 143.

**A Reticulosis.**—Hodgkin's disease (syn. lymphadenoma) produces large, discrete, non-tender lymph-nodes of firm rubbery consistency (*Fig. 287*). Palpate the axillae and the groins: the finding of a similar mass in one or both of these situations tends to support an hypothesis that will be strengthened if an abdominal examination reveals an enlargement of the spleen. Lymphosarcoma and other reticuloses cause softer but still discrete lymph-node enlargements. The exact diagnosis must rest on biopsy.

**Carcinomatous Lymph-nodes.**—The leading characteristic of secondary malignant nodes (*Fig. 288*) is the stony-hard impression they impart to the palpating fingers.

On many occasions the greater cornu of the hyoid bone is mistaken for a hard fixed lymph-node. In elderly subjects it tends to become ossified, when it certainly

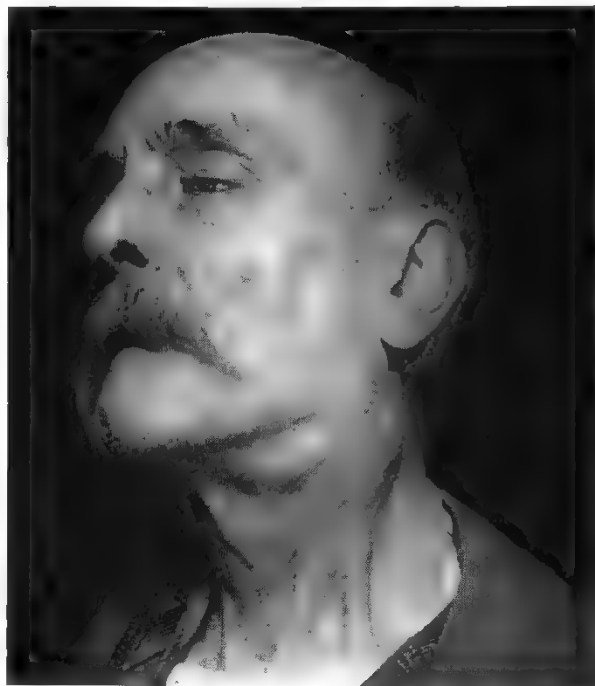
CHARLES E. TROISIER, 1844–1919, *Professor of Pathology, Paris.*  
 THOMAS HODGKIN, 1798–1866, *Curator of the Museum, Guy's Hospital, London. For 36 years Hodgkin's specimens of, and his dissertation concerning, these lymph-nodes remained unnoticed.*

does simulate a hard node: however, it lies farther forward than the lymph-nodes of the jugular chain, and its true nature can be revealed by asking the patient to swallow, when the bone will move upwards.

*If the physical characteristics of the enlarged nodes leave little doubt that they are malignant, but no primary growth can be discovered easily, a search must be made of the mouth, nasopharynx, hypopharynx, and larynx, thyroid, lung fields, and external auditory canal for the primary growth. If a source is still*



*Fig. 287.*—This massive lymphatic enlargement is composed of rather discrete lumps which feel firm like solid rubber. A case of Hodgkin's disease.



*Fig. 288.*—These lymph-nodes feel stony hard. The mass behind the sternomastoid is fixed to deeper structures. The primary growth was found on laryngoscopic examination. Case of carcinoma of the hypopharynx (*see p. 134*).



*Fig. 289.*—Tuberculous enlargement of the tonsillar lymph-node (*Stage I*).



*Fig. 290.*—*Stage IV*. Collar-stud abscess with skin involvement.

wanting biopsy may provide a clue to the origin of the metastasis as silent abdominal primaries sometimes metastasize to cervical lymph-nodes.

**Carotid Body Tumour.**—*See p. 145.*

### THE STAGES THROUGH WHICH A BREAKING-DOWN TUBERCULOUS CERVICAL LYMPH-NODE (OR NODES) PASSES

When any infected deep cervical lymph-node (or group of lymph-nodes) breaks down, it passes through stages each of which possesses physical signs peculiar to itself. Tuberculosis is the usual cause for the sequence to be described, but chronic pyogenic inflammation can cause identical signs. The stages, which like Hogarth's 'Rake' pass from bad to worse, are four in number:

*Stage I.* The physical signs are those of a solid enlargement due to inflammation (*Fig. 289*).

*Stage II.* In many instances, in due course, the lymph-node breaks down and liquefies, and the pus comes to occupy that confined space beneath the deep cervical fascia

Fluctuation can be elicited but, owing to the depth of the swelling and the tenseness of the contained fluid, there may be doubt on this point.

*Stage III.* After weeks or months, the dense, deep cervical fascial sheet becomes eroded, and the imprisoned pus, joyous, as it were, to escape from such a confined space, wells into the commodious compartment beneath the yielding superficial fascia, forming a collar-stud abscess. This stage is characterized by unmistakable fluctuation, but if the patient presents for the first time when Stage III has been reached, the swelling must be differentiated from other fluctuating swellings of the region by methods presently to be described (p. 144).

*Stage IV.* Still left to Nature, the superficial abscess steadily enlarges until the skin over its centre becomes inflamed (*Fig. 290*). If the abscess is allowed to burst, or is aspirated through unhealthy skin, or incised, there results a sinus that continues to discharge until the last of the necrotic material beneath the deep cervical fascia has been expelled, when, in favourable circumstances, it heals.

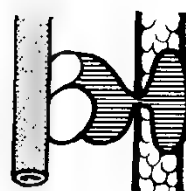
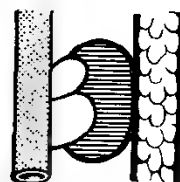
**Less Orthodox Cases.**—*a.* In a few cases the stem of the collar-stud is long: the tuberculous nodes that feed the abscess are situated some distance away, perhaps in another triangle of the neck. If the more distant areas of the neck are not palpated thoroughly for enlarged lymph-nodes, such an abscess (*Fig. 291*) will perplex the clinician.

*b.* When, as is not rarely the case, the tuberculous process is entirely limited to a small group of nodes, and the abscess is situated directly over them, the diagnosis is far from simple, for the enlarged nodes are masked by the abscess. In such a case, provided the overlying abscess is of moderate size, try to palpate deeply behind the swelling with the finger and thumb (*Fig. 292*).

### OTHER LATERAL CYSTIC SWELLINGS OF THE NECK

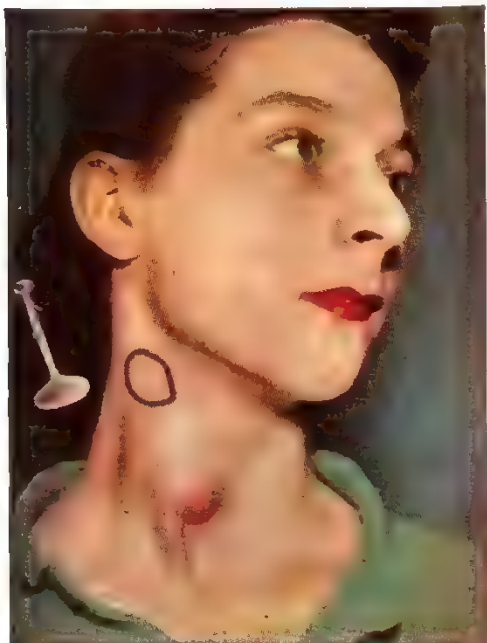
**Cystic Hygroma.**—This is met with in infancy or early childhood (*Fig. 293*). Due to intercommunication of its many compartments, the swelling is softly cystic, and is partially compressible, but the characteristic sign that distinguishes it from all other cervical swellings is that it is brilliantly translucent (*see Fig. 30, p. 14*). Occasionally, as a result of nasopharyngeal infection, the swelling becomes inflamed and may increase in size rapidly. Cystic hygromata occur also in the axilla, and rarely in the groin.

**Branchial Cyst** is very much more common than the foregoing, and usually it is encountered, not as one might expect, in childhood, but in early adult life.

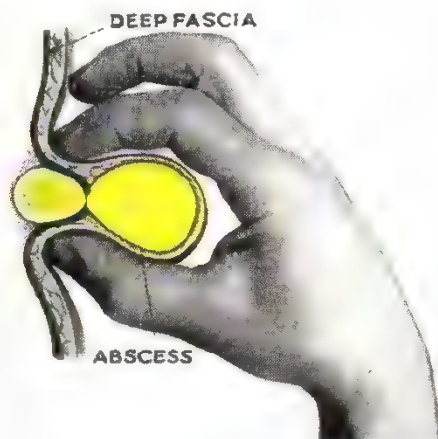




Almost without exception the patient presents with a cystic swelling of the upper third of the neck, deep to the upper third of the sternomastoid muscle, appearing around its anterior border (*Fig. 294*). Seeing that this is also the most common situation for a tuberculous cervical abscess, it is not surprising that a branchial cyst frequently is diagnosed in the first instance as the former. Occasionally the cyst becomes the seat of attacks of inflammation, which heighten the similarity. When uncomplicated



*Fig. 291.*—Long-stemmed collar-stud abscess.



*Fig. 292.*—By deep palpation between the finger and thumb an enlarged node can sometimes be felt beneath the cervical fascia.



*Fig. 293.*—Cystic hygroma. The swelling is brilliantly translucent.



*Fig. 294.*—A typical branchial cyst. Note its relationship to the upper third of the sternomastoid.

by inflammation, it imparts to the palpating fingers what has been described admirably as the sensation given by a half-filled rubber hot-water bottle.

If some of the fluid is aspirated pus-like material will be withdrawn in both instances. With a branchial cyst, when this is put in a dish and rocked to and fro,

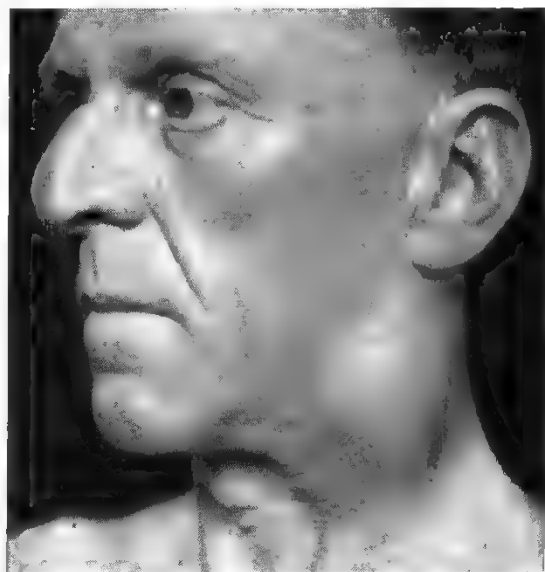
the shimmer of the lipid content probably will be noted, and a drop placed under the microscope will show an abundance of cholesterol crystals because the lining mucous membrane contains sebaceous glands. This finding makes the diagnosis of branchial cyst certain.

### SOME RARER CERVICAL CLINICAL ENTITIES

**Branchial Fistula.**—Nearly always this is congenital, and commences to discharge soon after birth. Occasionally the condition is bilateral. Commonly the orifice of the sinus is situated in the position shown in *Fig. 295*. The amount of excretion



*Fig. 295.*—Congenital branchial fistula, present for thirty years. Inset shows a radiograph after the sinus had been injected with lipiodol.



*Fig. 296.*—This swelling has been growing slowly for several years. The lump is hard and rather smooth, and transmitted pulsation can be felt. Case of carotid body tumour.

varies, and it is inclined to be sticky. Branchial fistulae are prone to attacks of inflammation, especially when the small orifice becomes temporarily occluded, and the discharge becomes pent up in the commodious interior (*Fig. 295*, inset). As a rule the track is incomplete, and ends blindly in the region of the lateral pharyngeal wall. From time to time a complete fistula is encountered, in which event the internal orifice is situated just behind the tonsil. A fistula can be acquired by incision of an inflamed branchial cyst. The resulting sinus, which is usually situated in the upper or middle third of the neck, continues to discharge, sometimes without ceasing, sometimes intermittently.

**Carotid Body Tumour** is situated at the bifurcation of the carotid artery, most usually in its fork. Nearly always unilateral, this tumour exhibits transmitted pulsation (*see p. 27*). An enlarged lymph-node in this area can also give rise to similar signs. Usually the tumour first becomes apparent in middle life, and increases in size very slowly. As it becomes larger, it extends in an upward direction. It is hard, tolerably regular in contour (*Fig. 296*), and shaped rather like a potato; indeed, it was called by Hutchinson 'the potato tumour'. The lump can be moved horizontally with ease, but has very little vertical mobility. A few patients complain of attacks of faintness; particularly in thin persons, pressure over the lump sometimes gives rise to slowing of the pulse-rate and a feeling of faintness—carotid-body syncope.

Although as a rule the neoplasm remains localized for years, eventually regional metastases occur in 20 per cent of cases, and distant metastases rarely.

**Pharyngeal Pouch.**—Those suffering from this condition are usually, but not necessarily, elderly, and it is commoner in men than in women. The leading



Fig. 297.—Pharyngeal pouch: A, before, and B, after, water has been swallowed. Inset, barium swallow, anterior view.

complaint is regurgitation of undigested food at an unpredictable time after a meal, during swallowing of the next meal, or after turning from one side to the other at night. Sometimes the patient is awakened from sleep by a violent fit of coughing. As the pouch enlarges there are gurgling noises in the neck, especially when the patient swallows. In about one-third of cases the pouch causes a visible swelling in the neck (*Fig. 297*), usually on the left side. The swelling is softly cystic, and when pressed upon the contents of the pouch—often foul fluid—are emptied into the pharynx and mouth; sometimes this is accompanied by audible and palpable gurgling. When this stage has been reached, the symptom that transcends all others is increasing dysphagia.

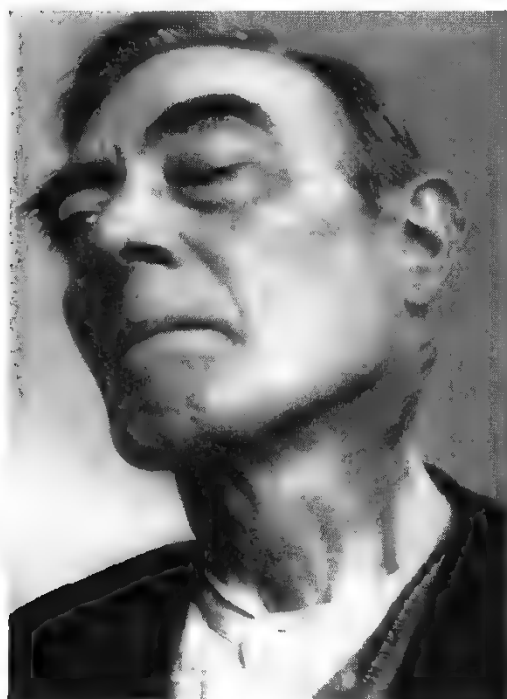


Fig. 298. Ptosis, ophthalmoplegia, and a mass of secondary malignant lymph-nodes of the neck signify that the primary growth lies in the nasopharynx.

**Cervical Metastases of a Carcinoma of the Nasopharynx** (*see p. 133*).—When a mass of metastatic cervical lymph-nodes is present (*Fig. 298*), the primary growth has, almost certainly, invaded the sphenoidal fissure. Through the sphenoidal fissure pass the third, fourth, ophthalmic divisions of the fifth, and sixth nerves; these may become implicated. Armed with this knowledge a precise diagnosis of this seemingly obscure and depressing condition becomes a matter of relative simplicity.

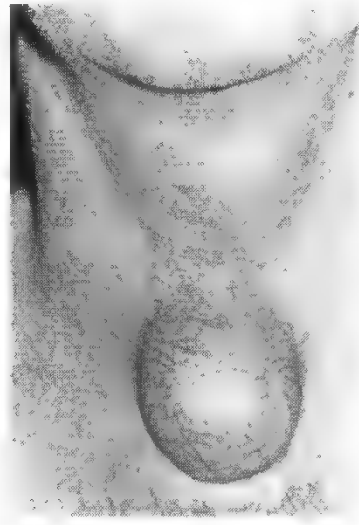
**Tumours of Nerve** can arise in the vagus, the hypoglossal, the sympathetic chain, or a cord of the brachial plexus and give rise to a firm, slowly growing, painless lump which is movable vertically but not horizontally, and is inclined to displace the external carotid artery anteriorly. In the case of a tumour of part of the brachial plexus it is vital not to remove the swelling without adequate exploration, on the mistaken diagnosis of 'enlarged

lymph-node'. Pressure on such a swelling will often cause pain down the arm in the distribution of the affected nerve.

**Laryngocele** is a unilateral (occasionally bilateral), narrow-necked, air-containing diverticulum resulting from herniation of the mucous membrane through the thyrohyoid membrane where it is pierced by the superior laryngeal vessels. When distended, it forms a visible, often resonant, swelling in the neck. It should be suspected if a swelling appears when the patient blows his nose (*Fig. 299*). It occurs in professional trumpet players, glass-blowers, and persons with a chronic cough. Cervical air pouches are present in many mammals, and can be inflated voluntarily. Certain South American monkeys utilize them for howling (howling pouches).



*Fig. 299.*—This swelling appeared when the patient blew his nose (laryngocele).



*Fig. 300.*—A lipoma in Burns's space.

**A Swelling in the Suprasternal (Burns's) Space** is rare. It is rendered more prominent by asking the patient to extend the neck fully. If cystic, it is usually a dermoid, but aspiration will differentiate it from a cold abscess. Solid swellings are usually lipomas (*Fig. 300*) or enlarged lymph-nodes. An aneurysm of the innominate artery exhibits expansile pulsation (*see p. 27*).

**Subcutaneous Emphysema of the Neck following Rupture of the Oesophagus.**—*See p. 200.*

### PRESSURE ON STRUCTURES AT THE ROOT OF THE NECK

**Cervical Rib Syndrome** (Scalene Syndrome; Superior Thoracic Aperture\* Syndrome).—Mass radiography has substantiated the belief that cervical ribs are not uncommon (0.4 per cent). In 70 per cent the rib is present on both sides. As a rule, there are no symptoms whatsoever. Conversely patients with symptoms and signs more frequently do not possess a cervical rib, the pressure presumably being caused by the vice-like action of the scalenus anterior and medius muscles on the structures running between them.

Normally, with the arm by the side, while the first thoracic nerve runs straight downwards, the subclavian artery describes a smooth curve over the broad upper surface of the first rib. Should the 7th cervical vertebra possess a rib, or a fibrous band representing that structure, the curve taken by the nerve and the artery to ascend over the comparatively narrow surface of the cervical rib is much accentuated.

\* Paris anatomical nomenclature which obviates the previous confusion between thoracic outlet and thoracic inlet, both of which were (and are) being used to denote this aperture.



For this reason, especially if the shoulder sags, vascular symptoms or, less frequently, nerve pressure symptoms, or both, sometimes supervene. Symptoms seldom appear before late adolescence, and in some instances they are precipitated by the patient's occupation, e.g., the postman with his bag, or by a change in occupation. Females are affected in a ratio of 2:1.

**Vascular Symptoms.**—Pallor, coldness, or cyanosis of the hands or fingers occur. In advanced cases, partial thrombosis of the subclavian artery leads to small emboli being thrown off and peripheral gangrene, particularly of the tip of the index finger, occurs occasionally. The differential diagnosis from Raynaud's phenomenon (*see* p. 392) may prove difficult. When a cervical rib is the cause, usually these symptoms are entirely unilateral; they tend to come on towards the end of the day or at night, and are often improved by raising the limb. Also, in the case of the cervical rib syndrome, often the radial pulse becomes perceptibly weaker when the arm is forcibly depressed by traction in a downward direction, but unfortunately, from the diagnostic standpoint, this phenomenon sometimes can be demonstrated in normal persons. More reliable is obliteration of the pulse by tensing the scalenus anterior muscle.

*Adson's Deep-breathing Test* depends on the fact that the scalenus anterior is an accessory muscle of respiration. Feel the radial pulse of the seated patient, who is requested to turn the head as far as possible *towards* the side of the symptoms. When asked, the patient takes a deep breath, and holds it. If inspiration causes a diminution or obliteration of the pulse, the sign is positive.

*A Subclavian Murmur* suggests that the artery is angulated over an obstruction.

**Nerve Pressure Symptoms.**—It is now realized that these are rare with the cervical rib syndrome (*see* Pain in the Upper Limb, p. 478). Unlike the carpal tunnel syndrome (*see* p. 473), shooting pain is usually ulnar in distribution and such pain may be associated with aching in the shoulder or the scapular region. The pain in the elbow tunnel syndrome (*see* p. 467) has a similar distribution but the muscle weakness is strictly confined to the territory of the ulnar nerve whereas in the cervical rib syndrome the muscles affected most severely are those supplied by T.1. Thus all the small muscles of the hand suffer, but not uncommonly wasting of the thenar eminence is especially noticeable (*Fig. 301*) and hypothenar wasting is generally present as well. Cutaneous hyperaesthesia or sensory loss is unusual but if present is confined to the T.1 dermatome.

**Examination of the Region of the Superior Thoracic Aperture.**—First, look and feel in the supraclavicular fossa for an abnormally elevated subclavian artery. The lump produced by the displaced artery not only pulsates, but is tender, and pressure upon it may reproduce the symptoms of which the patient complains. Next, the neck should be palpated. A well-formed, easily palpable (occasionally visible) cervical rib rarely gives rise to the cervical rib syndrome, but local tenderness usually is present over such a rib. In some instances the free extremity of the rib is expanded into a mushroom-like, finely bosselated, hard bony mass. As a rule, palpation is negative because a rib is either very small, or represented by a fibrous band or, more commonly, is not present.

**The Costoclavicular Syndrome** is encountered much less frequently than the cervical rib syndrome. Vascular symptoms predominate. As individuals grow older the muscles normally responsible for holding the clavicle away from the first rib, viz., the sternomastoid, trapezius, and levator scapulae, relax. From time to time, and especially when the patient has a congenitally narrow interval between the first rib and the clavicle (Weddell), the subclavian artery becomes compressed in this vice (Walshe). This syndrome can be segregated from other syndromes affecting the superior thoracic aperture, as follows: The patient is instructed to stand at military attention. The volume of the pulse is noted. He is then instructed to abduct the arm to a right-angle, and

finally to raise it above the head. If the costoclavicular syndrome is the cause of the symptoms, the pulse will weaken perceptibly in the last position.

### ARTERIAL OBSTRUCTION IN THE NECK

Atherosclerosis (*see* p. 388) is the usual cause. Due to blockage in one or more of the internal carotid and vertebral arteries there is a deficient anastomotic circulation in the circle of Willis. Depending on the site of major obstruction one of three syndromes may develop:—

1. Obstruction at the origin of an internal carotid artery (which comprises about two-thirds of cases of this type) leads to a classic hemiplegic stroke if complete, or a transient hemiplegia if incomplete ('little stroke'). In the latter instance surgical treatment is possible and it is important to realize that the finding of a systolic murmur on auscultation over the affected artery indicates the need for a more intensive investigation by arteriography.



Fig. 301.—Wasting of the thenar eminence in a case of cervical rib.

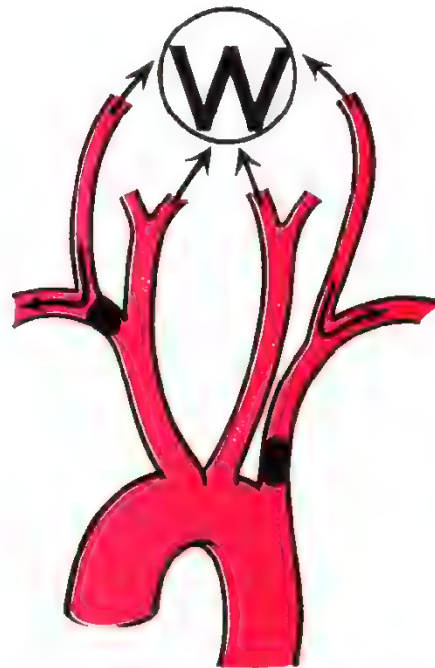


Fig. 302.—The cause of the subclavian steal syndrome; the sites of blockage in the subclavian arteries are shown in black. **W**—circle of Willis.

2. In approximately a third of patients the obstruction is at the origin of a vertebral artery from the subclavian, or in the subclavian artery itself. Giddiness initiated by neck movement is a leading symptom and again a systolic murmur in the lower neck is a most important sign. Subclavian arterial obstruction may be characterized by a history of intermittent claudication (*see* p. 388) affecting the arm.

3. A variety of (2) is the *Subclavian Steal Syndrome*; when the obstruction is in the subclavian artery *use of the arm* on the affected side may lead to a reversal of blood-flow in the ipsilateral vertebral artery (*Fig. 302*) with resultant brain-stem ischaemia. Giddiness and a murmur are noted as in (2) above but in addition the sign described by Javid is positive—compression of the common carotid artery in the neck on the affected side leads to a decrease in the retrograde vertebral flow (the circle of Willis anastomosis being reduced) and this in turn leads to a diminution of the radial pulse. In this syndrome too, the blood-pressure in the affected arm (as measured by a sphygmomanometer) is lower than on the normal side.

### THE CERVICAL SPINE

It will be stressed in Chapter XXXII how necessary it is to examine the cervical vertebral column in painful conditions of the upper extremity; conversely

THOMAS WILLIS 1621–1675, *Physician, Oxford*. First noticed the sweet taste of diabetic urine and described *myasthenia gravis*.

HUSHANG JAVID, *Contemporary Professor of Surgery, Chicago Medical Center, University of Illinois, Chicago*.

no examination of the cervical spine is complete without examining both upper limbs.

#### TESTING MOVEMENTS OF THE CERVICAL VERTEBRAL COLUMN

The patient is seated. After duly noting if he holds his neck stiffly or in a crooked position (torticollis, *see* p. 139), ask him to point to the site of the pain, if such is the complaint. The pointing finger passes to the side or to the back of the neck, and



Fig. 303.—Flexion.

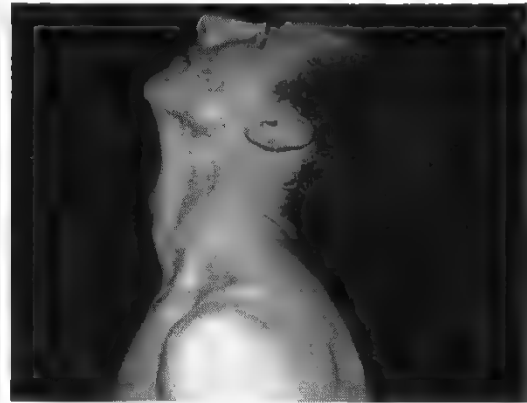


Fig. 304.—Extension.



Fig. 305.—Lateral bend.



Fig. 306.—Rotation.

at this juncture it is advisable for the clinician to view the neck from the side and from the back, at the same time requesting the female patient to lift her back hair with her fingers or a comb. Unless there is some acutely painful contra-indication, the next step is:—

*Testing Movements of the Cervical Vertebral Column* (Figs. 303–306).—The neutral position (*see* p. 446) is the position of ease as when one stands or sits. Nodding forwards and backwards takes place at the atlanto-occipital articulation. Flexion occurs mostly in the lower segments of the cervical spine. Lateral bend is the prerogative of the mid-segment, while rotation is the function of the atlanto-axial articulation. As age advances the movements of the neck, especially extension, become more restricted. Flexion suffers least in this way.

*Palpation and Percussion* are carried out in the same way as described in the section on the dorsolumbar vertebral column (*see* p. 209).

**Cervical Spondylosis.\***—It is probable that the primary lesion is a degeneration and loss of height of one or more intervertebral disks. This causes undue mobility at the level of the affected disk, and such mobility evokes osteophytic reaction and the deposition of transverse ridges of new bone at the intervertebral level, thereby causing a radiological appearance of 'osteoarthritis'. Pressure by an osteophyte on a nerve-root is responsible for the symptoms. It must be stressed that spondylosis is essentially a radiological diagnosis, and that 65 per cent of persons over the age of 50 years show such radiographic changes which are in fact, little more than a sign of advancing age, and a more reliable one than that of greying of the hair. When cervical spondylosis is the cause of painful symptoms referred to the upper extremity, a number of the following peculiarities are likely to be present. In a quarter

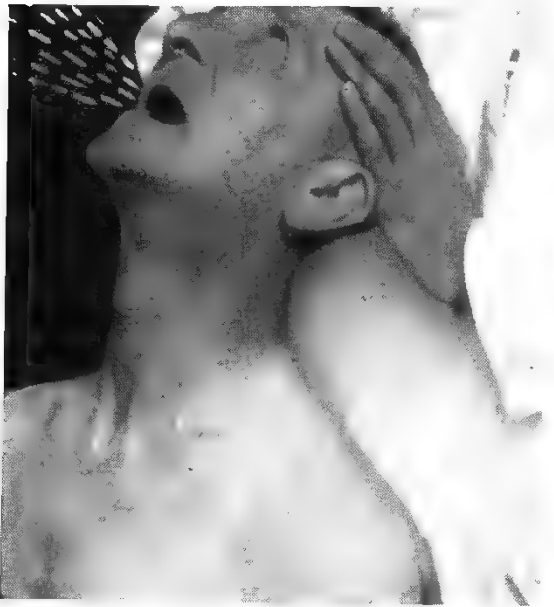


Fig. 307.—The cervical extension coughing test. With the head in this position, increasing the cerebrospinal fluid pressure by coughing causes or exaggerates nerve-root pain.



Fig. 308.—Direction of shooting pain in the cervical disk syndrome. It follows the lateral aspect of the limb, and usually goes no farther than the wrist.

of the patients there is a history of a remote head or neck injury. The intervertebral spaces affected most often are C.5–6 and/or C.6–7. The pain is *not* usually experienced mainly or exclusively in the periphery of the upper limb; there is also pain (though not necessarily at the same time) in the posterior part of the scalp and in the shoulder. Wasting of the muscles of the hand is rare. Weakness or absence of the biceps tendon-jerk indicates a lesion of the 6th cervical nerve-root, and of the triceps tendon-jerk a lesion of the 7th cervical nerve-root, the latter being commoner.

*A Confirmatory Sign that the Cervical Spondylosis (or Prolapsed Disk) is the Cause of Pain* is to hold the neck in hyperextension and then to ask the patient to cough (Fig. 307); if this induces the pain of which the patient complains, it supports a diagnosis of spondylosis.

The distribution of the pain tends to be inconstant and this, together with the age of the patient, helps in narrowing down the probable cause of the symptoms,

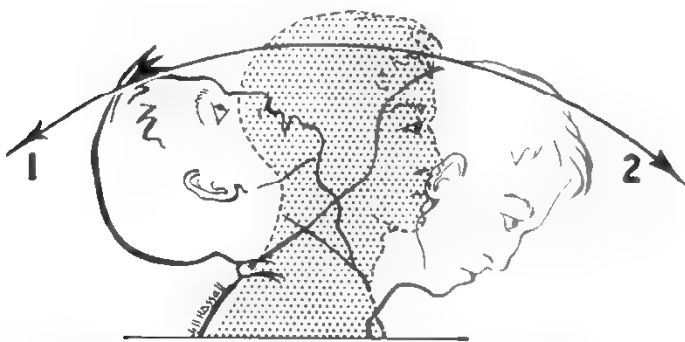
\* *Spondylosis*. Greek, *σπόνδυλος* = a vertebra + *ωσις* — a suffix denoting a morbid process.



for the diagnosis is necessarily one largely of exclusion. Other causes of pain in the upper limb (*see* p.478) should always be eliminated early in the diagnostic endeavour.

**Prolapsed Cervical Intervertebral Disk.**—The patient is younger than the usual sufferer from spondylosis. The symptoms come on in attacks, with intervals of complete freedom.

While, in a few instances, there is a remote history of a relevant injury, as a rule the initial attack arises in a less dramatic manner; for instance, while stretching on wakening from sleep. Typically there is a temporary phase of a stiff neck, with the head tilted away from the side of the symptoms, and exacerbations of sharp, shooting pain, which after a few days spread gradually to the lateral aspect of the shoulder, to the lateral aspect of the upper limb, and along the radial border of the forearm to the wrist (*Fig.* 308). Only occasionally does the pain radiate to the digits, but should it do so it is the thumb, index, and middle fingers that are affected. The pain is made worse by coughing, sneezing, or jolting of any kind.



*Fig.* 309.—Whip-lash force and recoil, common type. Forcible hyperextension is followed by flexion recoil.

*Rigidity of the Muscles of the Neck* of the affected side is often present.

*Muscle Tenderness* affecting the trapezius, pectoralis major, brachioradialis, and the extensors of the wrist is common.

*Tendon-jerks.*—Sometimes the triceps-jerk (C.7) is lost, or the biceps tendon-jerk (C.6) is weakened.

**Spinal Cord Involvement by Cervical Spondylosis and Disk Protrusions.**—(*See* p. 222.)

**Whip-lash Injury of the Neck.** A parked or slowly moving motor-car is rammed from behind. As the occupant's body is thrown forward, the head is thrown backward, and on recoil is pitched in the opposite direction (*Fig.* 309), these propulsions being the more violent because restraining muscles are off their guard. When the collision is head on, the lashing forces are reversed. Whip-lash injury to the neck also can occur by striking the head against a low beam while walking or running, or by receiving a punch on the chin.

The ligamentum nuchae is torn. Rarely, the tip of the 7th cervical spinous process is fractured. Except, perhaps, for mild shock, nothing amiss is noted at the time, but the next day some pain in the neck occurs. About 10 days later symptoms due to cervical nerve-root irritation commence. The patient develops a 'crick in the neck'. Unilateral occipital headache commonly follows. Sometimes there is blurring of vision.

Because of the characteristic posture, the diagnosis can be strongly suspected as the patient enters the consulting-room. The head is held rigidly; it is tilted away from the painful side, the chin is turned towards the painful side, and usually the head is held in slight flexion (*Fig.* 310).

*Palpation* demonstrates tenderness over the lower cervical spinous processes, and especially



*Fig.* 310.—Whip-lash injury of the neck. Characteristic posture when postponed symptoms develop.

over the interspinous spaces. Soft crepitus (effusion) sometimes can be felt over the lower part of the ligamentum nuchae.

*Biceps-jerk* frequently is absent on one or both sides.

*Pupils*.—In 5 per cent of cases the pupil on the side of the lesion is dilated (sympathetic irritation).



Fig. 311.—Rust's sign. Inset. radiograph shows caries of the 3rd and 4th cervical vertebrae.

#### **Fractures of the Neck.**—(See p. 222.)

**Pott's Disease of the Cervical Spine** is now comparatively rare except in communities with a low resistance to tuberculosis and living in poor economic conditions. The patient holds the head stiffly, either thrust forward or, more rarely, held in a wry-neck position. To spare turning the head (atlanto-axial articulation) the patient's eyes rotate to follow one's movement, as for example when recording the history. If asked to look at an object on the wall to the right or to the left, it is the *body* that is rotated. *Rust's sign* is often present: with every change of position, and often when the patient is seated, he supports his head with the hands (Fig. 311). The general signs, and some of the local signs, are similar to those of Pott's disease of the thoracolumbar region (see p. 217).

*Abscess Formation*.—An abscess connected with the body of a cervical vertebra is wont to give rise to a chronic retropharyngeal abscess (see p. 132).

PERCIVAL POTT, 1714–1789, *Surgeon, St. Bartholomew's Hospital, London.*

JAN N. RUST, 1775–1840, *Chief of the Surgical Clinic, St. Lazarus Hospital, Cracow, Poland.*

## CHAPTER XIV

## THE THYROID GLAND

**Inspection.**—In thin young women, the isthmus of the *normal* thyroid gland sometimes is apparent, particularly on swallowing. Otherwise the normal gland is not visible.

Inspection should never be hurried, for it is a highly important method of obtaining information regarding swellings of the gland. Sometimes it is obvious that the whole gland is enlarged (*see Fig. 324, p. 162*).

Because of the attachment of the thyroid gland to the larynx, a swelling will always *rise with deglutition*, unless the gland is fixed by neoplastic infiltration or inflammation. When there is a swelling that *may* be within the thyroid capsule, ask the patient to swallow. A thyroid swelling moves upwards, after which it descends again.

In obese and bull-necked individuals, inspection of the thyroid is rendered easier by the patient throwing her head backwards, and pressing her occiput against her clasped hands (*Pizzillo*) (*Fig. 312*).



*Fig. 312.*—Pizzillo's method of making the thyroid gland more prominent in cases where a short neck or a thick layer of subcutaneous fat renders inspection unsatisfactory.

**Palpation.**—Routine palpation should be conducted from behind. To relax the musculature, instruct the patient to lower the chin. Using both hands, place the thumbs upon the nape of the neck. In this way, a considerable portion of the fingers comes to overlie the right and left lobes of the gland (*Fig. 313*). Commence systematic palpation of the whole of the gland by determining the limits of the lower edges of the lobes, if necessary requesting the patient to swallow.

*Can the normal thyroid be felt on palpation?* In a reasonably slender person it can be felt as a smooth firm structure that moves upwards as he or she swallows.

Having determined definitely the shape and position of the lower limits of an enlarged thyroid, palpate the anterior surfaces of the lobes. These are examined

one at a time, and, in order to relax the overlying sternomastoid muscle, the head is inclined slightly to the side being examined.

In some instances information can be gained by asking the patient to extend the neck, instead of flexing it. In this position the gland becomes more prominent and more accessible, despite the increased tautness of the sternomastoid muscles.



Fig. 313.—Routine palpation of an enlarged thyroid gland.

When the whole thyroid gland is enlarged, determine whether its surface is smooth (as is found in primary thyrotoxicosis and in colloid goitre) or bosselated (characteristic of multinodular goitre). Ordinarily, unless the goitre\* is a very large one, as well as rising on swallowing, it can be displaced laterally with the finger, thus making it apparent that the muscles slide freely over the swelling. Fixation suggests malignancy which has broken through the thyroid capsule, or thyroiditis, or scarring due to a previous operation.

Especially when a swelling is localized to one portion of the thyroid, further examination is best conducted from in front, with the clinician seated. With the fingers define the limits of the swelling and decide in which lobe and at which pole it is situated, or whether it is in the isthmus. Record your findings (*see Fig. 2, p. 3*).

Having demonstrated that a swelling is the enlarged thyroid or is situated therein, the clinician must decide the following questions:—

*Firstly*, and most important, is the swelling obstructing the trachea? This is uncommon, but vital because of the danger of asphyxia.

*Secondly*, are there signs of thyrotoxicosis, either of the primary type (*below*) or of the less usual secondary type (p. 157)? In practice this is easily the most frequent complication.

*Thirdly*, is the goitre malignant (p. 158)? If so, tracheal obstruction may be present in addition.

*Fourthly*, does the swelling extend behind the sternum (retrosternal goitre) (p. 159)? This is also uncommon, but tracheal obstruction may be caused.

*Finally*, is there evidence of myxoedema (p. 160)?

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\* *Goitre*. Latin, *guttur* = the throat.



### TRACHEAL OBSTRUCTION

As the patient breathes a harsh noise is produced by the passage of air through the partially obstructed air-passage (stridor). If the obstruction is slight the noise can only be detected if listened for carefully in a quiet room. Later, dyspnoea, cyanosis, and restlessness make the diagnosis obvious.

**Kocher's Test.**—Slight compression on the lateral lobes produces stridor. If this test is positive it signifies that the patient has an obstructed trachea.

Narrowing of the trachea is found in carcinoma of the thyroid, retrosternal goitres, the 'scabbard' trachea of long-standing multinodular goitre, and in Riedel's thyroiditis. *See also Dysphagia Lusoria*, p. 156.

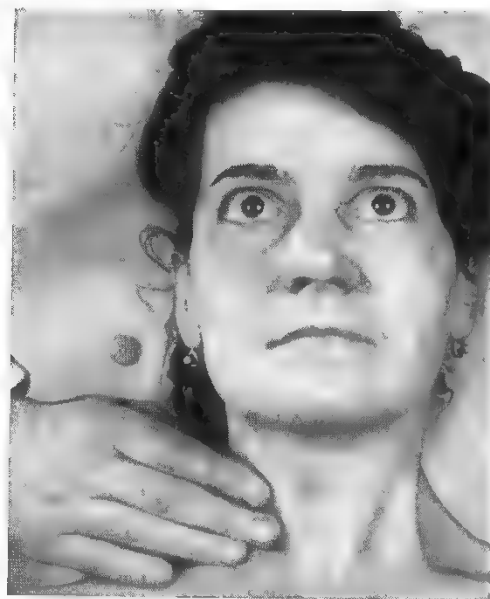
**Riedel's Thyroiditis** is characterized by tracheal obstruction in the presence of a small goitre that is always stony hard and often irregular in contour. It should be thought of if the patient, usually male, is below the age that such signs would point to scirrhus carcinoma, but the diagnosis must be confirmed by biopsy.

### HYPERTHYROIDISM

**Primary Thyrotoxicosis (Graves' Disease; Exophthalmic Goitre).**—Signs of hyperthyroidism are often obvious enough to be recognized at a glance (*Fig. 314*), but they can be so masked that they escape attention. Most patients are relatively



*Fig. 314.*—Graves' disease (exophthalmic goitre).



*Fig. 315.*—Seeking a thyroid thrill. Note the exophthalmos.

young females, and almost invariably the thyroid gland is enlarged symmetrically. Rarely there is no thyroid enlargement either in the neck or retrosternally (*latent hyperthyroidism*).

**Exophthalmos.**—In more than half the patients with primary thyrotoxicosis eye signs are present. These are discussed fully on pp. 74–77.

**Weight Loss** may be obvious and in any case should be asked about.

**The Skin** is moist. As a prelude to examining the pulse at the wrist, take the opportunity to feel the hands. In Graves' disease the hands, particularly the palms, are inclined to be hot and moist. These patients find hot weather intolerable, but exhibit increased tolerance to cold.

*The Pulse* should next be counted. In hyperthyroidism the rate is increased; probably it will be exaggerated by the nervousness occasioned by the examination. In addition great attention should be paid to the regularity of the pulse or otherwise. When it is both rapid and irregular, auricular fibrillation should be suspected and the difference, if any, between the pulse-rate at the wrist and the heart-rate, as counted over the precordium, noted. Early cases of Graves' disease are frequently mistaken for an anxiety state. A helpful method of differentiating is to arrange for the pulse-rate to be taken while the patient is asleep. In thyrotoxicosis the *sleeping pulse-rate* is still fast; in anxiety state it is within normal limits.

*Tremor.*—A fine tremor of the hands is almost invariably present. Ask the patient to place her hands straight out in front and spread the fingers or ask her to put out her tongue, and to keep it out for half a minute.

*A Thyroid Thrill* is almost pathognomonic of Graves' disease, but it is present only in comparatively advanced cases with greatly increased vascularity of the gland. The hand must be laid quite lightly over the lateral lobe (Fig. 315), otherwise it is the transmitted pulsation of the carotid arteries that will be felt. Auscultation will often reveal a systolic murmur.

**Secondary Thyrotoxicosis** develops in long-standing cases of multinodular goitre or adenoma of the thyroid. Examination reveals less tremor and a less



Fig. 316.—Secondary thyrotoxicosis. An adenoma has been present in the right lobe of the thyroid gland for 25 years. The patient is dyspnoeic and breathes through the open mouth. On the slightest exertion, she gasps.

clammy skin than with primary thyrotoxicosis. Of cardinal importance is that *eye signs, including exophthalmos, are almost invariably absent*. Auricular fibrillation is common; at times it is the presenting evidence of thyrotoxicosis. Usually the heart is enlarged, and occasionally by the time the patient presents there are signs of cardiac decompensation such as oedema of the ankles, dyspnoea (Fig. 316), and orthopnoea.\* A patient with secondary thyrotoxicosis nearly always has had a non-toxic lesion of the thyroid gland for many years, and consequently is older than the average sufferer from primary thyrotoxicosis.

\* *Orthopnoea*. Greek, *ὀρθός* straight + *πνοιά* = breath. Inability to breathe except in an upright position.

### THE MALIGNANT THYROID

This is not necessarily a disease of the elderly: it occurs almost as frequently in young adults and should be suspected in the following circumstances:—

1. A rapidly enlarging solitary swelling in the thyroid. Sudden increase in size associated with *pain* indicates a haemorrhage within the capsule and does not necessarily denote malignancy.

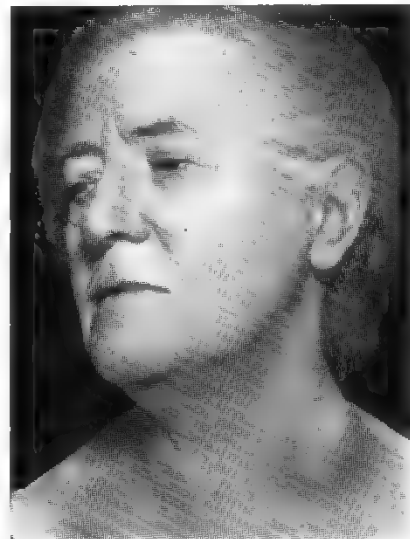
2. Hardness of part or whole of the swelling which can be likened to that of an unripe apple.

3. A change in a long-standing goitre which commences to enlarge much more rapidly than previously.

4. Loss of mobility of the gland. In the early stages the gland moves upwards on swallowing, as usual, and there is no loss of lateral mobility of the gland; however, lateral mobility becomes restricted before there is any noticeable difference in movement on deglutition.



*Fig. 317.*—Seeking the pulsation of the carotid artery. Berry's sign. The pulsation could not be detected in this case of carcinoma of the thyroid.



*Fig. 318.*—Enlargement of lymph-nodes in a patient with carcinoma of the thyroid.

5. *Berry's Sign.*—When the gland enlarges it displaces the carotid tree backwards and outwards. Consequently, in many cases of large goitre the pulsation of the carotid artery can be felt behind the posterior edge of the swelling. The displaced artery is much less in evidence when the thyroid is the seat of malignant disease, for it tends to become surrounded by the tumour (*Fig. 317*).

6. Tracheal obstruction (*see p. 156*).

7. When a patient with a goitre is found to be suffering also from Horner's syndrome (*see p. 413*) or hoarseness (recurrent laryngeal nerve palsy) it suggests that the goitre is malignant and has spread locally.

8. Lymph-node enlargement (*Fig. 318*). Occasionally a comparatively young patient presents with enlarged lymph-nodes in the neck, usually unilateral, and the primary growth in the thyroid is so small that it is impalpable. Biopsy is then the only method of arriving at the correct diagnosis.

## RETROSTERNAL GOITRE

A retrosternal goitre is found particularly in short-necked individuals. Any thyroid enlargement can come to lie partially retrosternally. In most instances the enlargement is an adenoma. Rarely does the whole of an enlarged thyroid lie in the superior mediastinum. In this instance there is no thyroid gland to be felt in the neck but when the intrathoracic pressure rises while coughing the goitre may be seen; this is termed a *plunging goitre*.

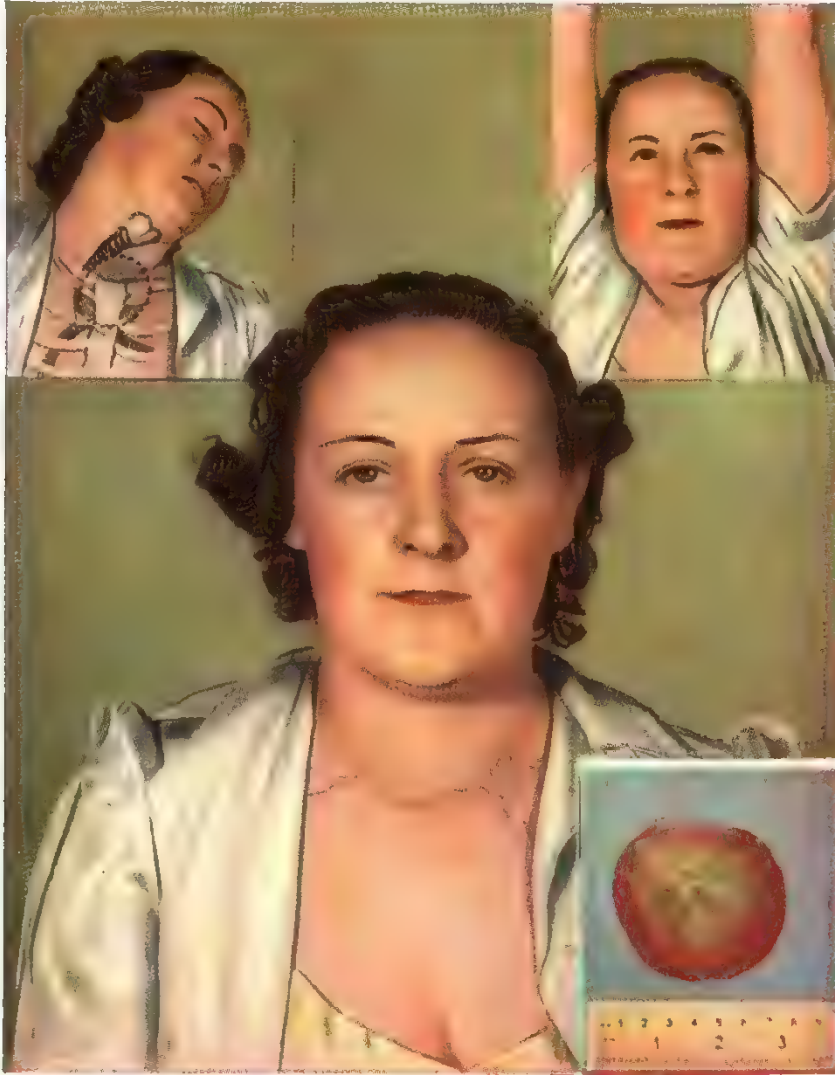


Fig. 319.—Retrosternal goitre. Dilated veins over the thoracic inlet were the key to the diagnosis. *Left inset*, the cause of the nocturnal dyspnoea when the patient sleeps on her left side. *Right inset*, congestion of the face when the arms are elevated. *Inset below*, the adenoma which was removed.

Sometimes a goitre situated wholly within the thorax eventually becomes toxic, and because the swelling is not visible, the symptoms to which it gives rise are attributed to heart disease or neurosis. Again, the dyspnoea which a retrosternal goitre occasions may be mistaken for asthma. Mindful of this, meticulous clinical examination sometimes renders X-ray demonstration of the presence of a retrosternal swelling of confirmatory value only.

Dilated veins over the upper part of the thoracic wall (*Fig. 319*) due to pressure upon the internal jugular veins occasionally provide a clue to the diagnosis;

rarely oedema of the face ensues from the same cause. Occasionally (for reasons obvious on reference to *Fig. 319*, inset *left*), tilting the head strongly to one side produces a sensation of dyspnoea.

Inquire if the patient is troubled with *nocturnal* dyspnoea. Information may be forthcoming that an attempt to sleep on one side produces such difficulty in breathing that the patient always sleeps on the other side.

Ask the patient to elevate both arms until they touch the sides of the face (*Fig. 319*, inset *right*). After a few moments congestion of the face, some cyanosis, and lastly distress may become apparent—presumably from narrowing of the thoracic inlet and consequent obstruction to the great veins (Pemberton).

Deviation of the trachea (*see Fig. 392*, p. 198) is a sign of great moment as confirmatory evidence of a goitre below the superior thoracic aperture.

*Dysphagia*.—Slight difficulty in swallowing is sometimes present, but it is never a major complaint.

*Haemoptysis*, unmixed with sputum, occasionally is a presenting symptom. It is due to rupture of an engorged tracheal vein (Burgess).

Of all the methods of diagnosis, palpation performed carefully during deglutition is the most reliable, and usually in this way a retrosternal goitre can be differentiated from a mediastinal neoplasm.



*Fig. 320.*—Myxoedema. The malar flush is a burgundy colour. The hair of the head is dry and scanty. Note the oriental slant of the eyes.



*Fig. 321.*—Hashimoto's disease.

### HYPOTHYROIDISM

Cold hands, mental slowness, puffiness of the eyelids, and perhaps ill-marked outer halves of the eyebrows should awaken in the mind of the clinician the possibility of myxoedema. The patient feels the cold weather intensely. If the hands are warm to the examiner's touch, a diagnosis of myxoedema is as likely to be wrong as is the diagnosis of hyperthyroidism when the patient's hands are cold. In established cases the face has a bloated look, with the eyes narrowed by puffiness (*Fig. 320*), giving a somewhat oriental appearance. The complexion is waxy-

HUGH S. PEMBERTON, 1891–1956, *Physician, David Lewis Northern Hospital, Liverpool.*

PETER BURGESS, *Formerly Clinical Assistant in Surgical Research, Withington and Wythenshawe Hospitals, Manchester.*



yellow, with a burgundy flush of the cheeks (*Fig. 320*). Only in advanced cases is there a substantial loss of hair (Asher). The voice at this time is like that of the recording of a worn disk on a gramophone that needs speeding up. The pulse is slow. The temperature is often subnormal. Examine the supraclavicular fossae for pads of fat and the region overlying the 7th cervical vertebra for a fatty 'hump', but their absence does not disturb the diagnosis. On palpation, the skeletal muscles seem hard, and the pseudomucin-laden subcutaneous tissues everywhere are firm and podgy (pseudo-oedema). The neck is scrutinized, but owing to pseudo-oedema it is often most difficult to be certain whether any of the thyroid gland can be made out, or not. This is in contrast to the examination of the neck of an infant suffering from sporadic cretinism (*see p. 89*), where one can feel the rings of the trachea so plainly that it is possible to be confident of an absence of the thyroid gland.

*See also* Pretibial Myxoedema, p. 11.

**Myxoedema Coma.**—Hypothermia is a terminal complication of long-standing untreated cases. Nearly always it supervenes during mid-winter, and is sometimes preceded by epileptiform convulsions. Characteristic of hypothermia (whether due to myxoedema or otherwise) is that the unconscious patient's skin is reminiscent of touching the skin of a toad—deadly cold. The rectal temperature falls as low as 24 °C.

**Hashimoto's Disease** (*Struma*\* *Lymphomatosa*).—This condition is not uncommon. Usually the first symptom is a lump in the neck. On inspection the whole gland is enlarged; nevertheless, one lobe is often larger than the other, or the pyramidal lobe or the isthmus is disproportionately enlarged (*Fig. 321*). On palpation the thyroid is found to be of rubbery consistency with bosselations so much less pronounced than those of a multinodular goitre that they may be described as mere undulations. It is characteristic of Hashimoto's disease that the contour of the gland can be defined clearly, but in many instances the hardness suggests carcinoma. Symptoms of mild hypothyroidism are usually present. The condition is seen predominantly in females who have just passed the menopause. Special blood tests show antibodies to the thyroid gland.

### THYROID ENLARGEMENT IN THE EUTHYROID† PATIENT

Notwithstanding the above considerations, remember that the majority of patients with thyroid disease do not, at any rate in the first instance, exhibit complications. It is convenient to deal with these conditions in chronological sequence.

**Goitre in Infancy** is seen in areas of endemic goitre (*see below*), or is due to therapy for thyrotoxicosis administered to the mother during her pregnancy. The excessive secretion of thyrotropic hormone is carried to the foetus via the placental blood and the response is that the thyroid gland hypertrophies (*Fig. 322*). Conversely, untreated thyrotoxicosis in pregnancy leads to classic Graves' disease in the newborn infant.

**Lingual Thyroid.**—Reverting to the subject of ascertaining whether a thyroid gland is present in front of the trachea, one should remember that when the thyroid occupies an aberrant position, the aberrant gland is often the only thyroid. Such a thyroid can be situated anywhere in the thyroglossal tract: that is, from the foramen caecum of the tongue to where the isthmus of the normal thyroid should be situated. It behoves one, therefore, when confronted with a central swelling at the back of the tongue (*Fig. 323*) or a swelling believed to be a thyroglossal cyst to make it a rule to ascertain by palpation whether a thyroid gland is present in the normal situation.

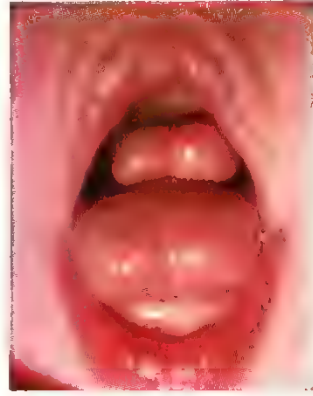
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\* The River Struma arises in Bulgaria and flows into the Aegean Sea. Along its banks is an endemic goitre area. *Struma* is an alternative term for goitre.

† Euthyroid. Greek, εὖ well + thyroid = normally functioning thyroid, neither hyper- nor hypothyroid.



*Fig. 322.*—Congenital goitre. The thyrotoxic mother was given prolonged therapy during her pregnancy.



*Fig. 323.*—Lingual thyroid.

**Physiological Hyperplasia of Puberty\*** is almost confined to females. The thyroid gland is enlarged evenly, and feels comparatively soft. With the passage of a few years the enlargement subsides gradually, and has all but disappeared by the twenty-first year. However, all goitres of puberty that do not subside completely must be considered potential colloid goitres.

*Mensuration of the Thyroid* at three-monthly intervals is sometimes of value, particularly in cases of goitre of puberty. Measurements are taken with a linen tape-measure around the neck at the level of maximum swelling. In assessing any increase in size due allowance should be made for natural growth of the patient at this age.



*Fig. 324.* Colloid goitre. Uniform enlargement of the whole thyroid is present.



*Fig. 325.* Multinodular goitre. Enlargement of both lateral lobes and of the isthmus can be seen.

**Colloid Goitre.**—Usually the patient presents between the ages of 20 and 30 years, i.e., after physiological hyperplasia should have subsided. The whole of the thyroid gland is affected, and as a rule the deformity is most obvious (*Fig. 324*).

On palpation, the swelling is found to be elastic and tolerably smooth.

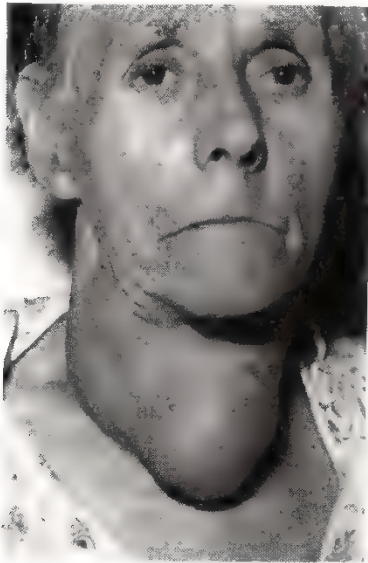
**Multinodular Goitre** is occasionally sporadic but usually endemic in regions where the drinking water is deficient in iodine. In such localities many of the

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\* Some physiological hyperplasia occurs also during pregnancy and at the menopause.

children (girls more than boys) have a visible and palpable smooth, soft, symmetrical enlargement of the thyroid gland, but after puberty many of these enlargements subside. In a proportion, varying from district to district, the goitre continues to enlarge, and becomes multinodular (*Fig. 325*). The whole gland is studded with rounded swellings, varying in size. At times these nodules can be palpated in a thyroid that seems otherwise normal; more often the whole gland feels replaced by rounded bosselations, sometimes alike in consistency, at others varying in consistency from hard to fluctuant. When a nodule, or a conglomeration of contiguous nodules, is very hard—much harder than the remainder—two possibilities spring to mind: (*a*) a carcinomatous change has taken place: (*b*) calcification has occurred. Neither is very infrequent in long-standing cases. Radiography is required to settle this differential diagnosis.

**Adenoma.**—This, the commonest affection of the thyroid gland in non-



*Fig. 326.*—Large adenoma of the right lobe of the thyroid gland.



*Fig. 327.*—Tetany; the 'obstetrician's hand'.

goitrous areas, tends to produce an asymmetrical enlargement of the gland (*Fig. 326*). If the swelling is visible it will be seen to move upwards when the patient swallows. Define the lump and make out its relationship to the rest of the thyroid gland. Next ascertain its relationship to the trachea which is displaced in extravagant cases. By far the most common situation for a solitary adenoma is at the junction of the isthmus with one lateral lobe.

**Subacute (de Quervain's) Thyroiditis.**—The patient, who may have had an antecedent upper respiratory infection, complains of pain in the region of the thyroid gland. Often the pain radiates to the ears and is associated with pain on swallowing. The condition usually is found in a female aged 40–60 who exhibits a low-grade pyrexia. Examination reveals a tender finely nodular moderate enlargement of the gland with overlying redness of the skin. Spontaneous recovery takes place over a period of two to three months.

### THE PARATHYROIDS

An enlarged parathyroid gland is hardly ever palpable upon clinical examination. It can be found only by exploration when the whole thyroid gland has been

displayed at operation. However, in suspected cases of hyperparathyroidism, particularly in examples of recurrent renal calculus and in osteitis fibrosa cystica, an attempt should be made by systematic palpation to discover a possibly enlarged parathyroid before setting in motion appropriate special investigations. Nevertheless, a palpable swelling, in the presence of hyperparathyroidism, is more likely to be a coincident thyroid adenoma than a parathyroid adenoma.

**Parathyroid Tetany**, an uncommon complication of thyroidectomy, occurs most frequently from one to five days after operation, but occasionally mild forms of this condition are not recognized for several weeks. It is due to hypoparathyroidism consequent upon the removal of two or more parathyroid glands. The first symptoms are tingling and numbness of the lips, nose, and the extremities, sometimes accompanied by circumoral pallor.

*The Chvostek-Weiss Sign.* With a percussion hammer, gently tap the 7th nerve as it courses in front of the external auditory meatus. When tetany exists, the tapping of the hyperexcitable nerve provokes a brisk muscular twitch on the same side of the face.

*Trousseau's Sign.*—A sphygmomanometer cuff is placed around the arm and the pressure raised to 200 mm. Hg. If tetany is present, in five minutes typical contractions of the hand are seen—the fingers are extended except at the metacarpophalangeal joints, and the thumb is strongly adducted, the combined effect of which is to produce the so-called 'obstetrician's hand' (Fig. 327).

In severe cases painful cramps of the hands, feet, and indeed all the muscles of the body occur. Strong adduction of the thumbs is almost always present, and this, coupled with extension of the feet, constitutes the 'carpo-pedal spasm'. Occasionally spasm of the muscles of respiration culminates in severe dyspnoea, and the patient is not only in great pain, but is in mortal dread of suffocation. Blurring of vision due to spasm of the intra-ocular muscles is common. Even if the symptoms are mild, prolonged unrectified hypocalcaemia gives rise to cataracts.

### THE THYROGLOSSAL TRACT

**Thyroglossal Cyst** can appear at any time of life, and in contradistinction to a branchial cyst (see p. 143) it is often encountered in early childhood.

*Differential Diagnosis.*—As a rule, the diagnosis is tolerably simple. Certain difficulties are met with from time to time; the chief of these results from a peculiar liability of these cysts to infection. If it comes under observation for the first time when thus complicated, an erroneous diagnosis of a collar-stud abscess connected with a tuberculous lymph-node may be made.

Bearing in mind that it is seldom large enough to exhibit definite fluctuation (or that its contents are too tense for this sign) and that it is seldom translucent, the sign of a thyroglossal cyst depends on its anatomical connexion via the thyroglossal duct with the base of the tongue. A thyroglossal cyst thus *moves upwards when the tongue is protruded*. Request the patient to open his mouth. Grasp the swelling between the finger and thumb (Figs. 328, 329). Then instruct him to put out his tongue: to put it in and put it out again. As the tongue is fully protruded a certain amount of movement of all swellings in this region is to be expected, but in the case of a thyroglossal cyst the upward tug is unmistakable. With an adenoma of the thyroid isthmus this sign is negative but the swelling will be found to move upwards on swallowing.



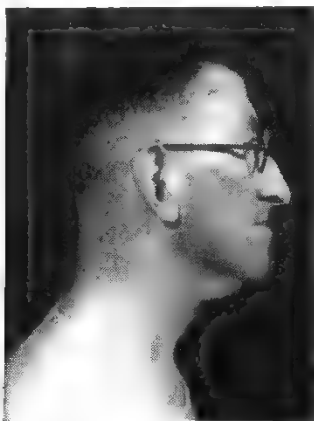
A diagnosis of thyroglossal cyst is not complete without determining the presence of a thyroid gland in its normal position (*see* Lingual Thyroid, p. 162).



*Figs. 328, 329.* If the swelling is a thyroglossal cyst, the upward tug when the patient fully protrudes his tongue is characteristic. Note that the mouth must be open when the swelling is grasped.

*Special Clinical Features of Thyroglossal Cysts at Various Levels.—*

1. **Suprahyoid.**—A thyroglossal cyst situated immediately above the hyoid bone (*Fig. 330*) must be distinguished from a median sublingual dermoid cyst (*see* p. 126).
2. **Subhyoid** (*Fig. 331*) is the commonest site for a thyroglossal cyst.



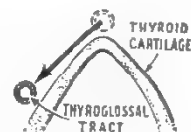
*Fig. 330.*—Suprahyoid thyroglossal cyst.



*Fig. 331.*—Subhyoid thyroglossal cyst.

3. **At the Level of the Thyroid Cartilage.**—It is often stated that the swelling cannot be a thyroglossal cyst unless it is strictly in the midline. The exception to this rule is a cyst in relation to the ala of the thyroid cartilage. The thyroid cartilage, shaped like the prow of a ship, in the course of its development sweeps the thyroglossal tract to one side, usually to the left, viz. —————→

The levator glandulae thyroideae in dissecting-room subjects is found usually on the left side of the thyroid cartilage. One would therefore expect a thyroglossal cyst at this level to be situated on the left side, and this is so in more than two-thirds of all cases. This deviation from the midline makes the differential diagnosis from an enlarged lymph-node more difficult, but the manœuvre shown in *Figs. 328, 329* has proved absolutely reliable in segregating these two conditions.





4. **At the Level of the Cricoid Cartilage.**—Thyroglossal cysts at this level are less common than any of the foregoing, and they tend to assume the midline once more. It is here that the differential diagnosis between a thyroglossal cyst and an adenoma of the isthmus of the thyroid, which has been referred to already, must be made.

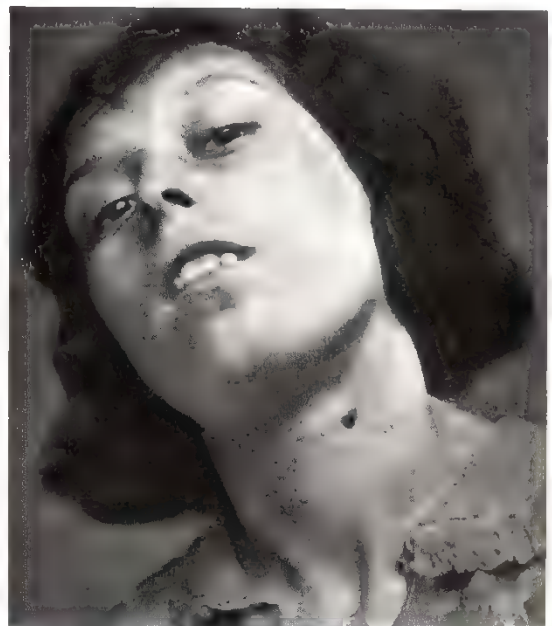


*Fig. 332.*—Thyroglossal fistula. An inflamed cyst was incised in early childhood and the discharge continued. Attacks of inflammation recurred at frequent intervals.

A **Thyroglossal Fistula** can result from bursting (or incision) of an inflamed thyroglossal cyst. More often, it is an aftermath of local removal of a cyst as opposed to extirpation of the whole of the thyroglossal tract. Usually it is situated strictly in the midline (*Fig. 332*), but in cases following incomplete removal of the thyroglossal tract the fistula may present itself at one or other extremity of a transverse scar (*Fig. 333*).

In such cases, and when the fistula is situated low in the neck, the condition is liable to be confused with a sinus connected with a tuberculous lymph-node. Endeavour to express a bead of the discharge from the fistula; usually the discharge is purulent and a scab must be removed to give it exit; less often a glairy yellow or brown fluid runs more or less freely from the fistula.

The most common level for the orifice of the fistula is just below the hyoid bone, also the favourite site for a thyroglossal cyst, but fistulae of very long standing, i.e., those originating in infancy, tend to be situated lower in the neck. The skin surrounding these has a peculiar crescentic appearance due to the uneven rates of growth of the thyroglossal tract and the rest of the neck, causing tension at the point where the fistula pierces the skin.



*Fig. 333.*—Thyroglossal fistula at the lateral extremity of a scar following incomplete removal of a thyroglossal cyst.

## CHAPTER XV

## THE BREAST AND AXILLARY LYMPH-NODES

THE breasts are examined while the patient, undressed as far as the waist, sits upright. This position is undoubtedly best for examination of the axilla (*see p. 177*) but the supine position is sometimes better for examination of the breast itself.



*Fig. 334.*—Comparison of the level of the nipples. This case of neoplasm of the left breast shows the nipple raised on the affected side.



*Fig. 335.*—Retraction of the nipples, present since the breasts developed. The patient had no complaint regarding the breasts.



*Fig. 336.*—Recent retraction of the nipple. Note also the skin dimpling above the nipple.



*Fig. 337.*—Mastitis carcinomatosa.

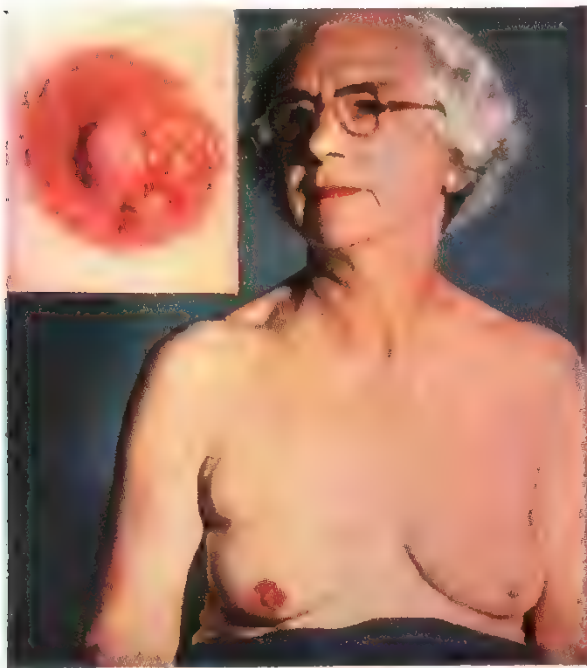
If you are in doubt after examining the patient sitting upright, ask her to lie flat and re-examine the breasts, palpation of which against the underlying chest wall may enable a confident diagnosis.

## ROUTINE EXAMINATION OF THE BREASTS

**Inspection.**—If the skin over the breast is reddened, inquire if the patient has lactated recently. Observe the level of the nipples (*Fig. 334*): remember that sometimes the left breast normally hangs slightly lower than the right.

**The Nipples.**—If retraction is observed (*Fig. 335*), ask the patient how long this has been present; it is of cardinal importance only if it is recent (*Fig. 336*), when it indicates that neoplastic (or rarely inflammatory) fibrosis is proceeding in the breast. A lump in a breast subject to *long-standing* nipple retraction may be a carcinoma, but often it is a chronic abscess caused by a blocked duct.

Close inspection of the nipple may reveal a crack, which is sometimes of considerable diagnostic importance in cases where a deep-seated breast abscess is in question. In this connexion one should not hastily conclude that, because the breast looks inflamed, a more serious condition can be ruled out. In cases of mastitis carcinomatosa (*Fig. 337*) the proliferation of carcinoma is so rapid that heat and redness are present. A dry eczema of the nipple strongly suggests Paget's disease (*Fig. 338*).



*Fig. 338.* Paget's disease of the nipple (right); a mass of carcinomatous lymph-nodes is visible in the right subpectoral region. *Inset* shows a close-up of the lesion on the nipple and areola.

**The areola** should be inspected and the degree of pigmentation, if any, noted. Remember that the specialized glands of Montgomery are subject to the same affections, notably retention cyst (*Fig. 339*) and abscess, as other sebaceous glands.

**The remainder of the skin of the breast** now receives attention.

**Visible veins** coursing over both breasts are of no diagnostic significance, but if such veins are discerned on one side only, usually it indicates that there is an active lesion in that breast. Also look for alteration in the quality of the skin (*peau d'orange*) (*Fig. 340*). The earliest manifestation of this phenomenon is seen best with the aid of a magnifying glass (*Fig. 341*). *Peau d'orange* is rendered more obvious by squeezing the skin gently (*Fig. 342*). By the time a breast cancer has ulcerated through the skin (*see Fig. 365*) the diagnosis is obvious even to the most inexperienced



medical student. The *ulcer* has the characteristics of an epithelioma (see p. 36). Another visible manifestation in a late case is the presence of *nodules* in the skin wide of the tumour.

When the arms are raised fully above the head, visible signs of carcinoma (e.g., tethering of the skin) frequently become more apparent (Auchincloss).

**Palpation.**—If the patient has noticed a lump, ask her to find it herself, before you attempt to do so. Commence by examining the opposite breast. Next, palpate the four quadrants of the breast systematically between the pulps of the finger and thumb.\* A useful routine is shown in Fig. 343. The normal breast gives a firm lobulated impres-



Fig. 340.—Very advanced *peau d'orange*.



Fig. 339.—An inflamed retention cyst of Montgomery's follicle. If this is incised, a chronic sinus will result.



Fig. 341.—*Peau d'orange* is conspicuous when viewed through a magnifying glass.

sion with nodularity a feature, particularly before the periods. In fat patients (and after the menopause when fat is laid down in the breasts) expect to feel both lobulation and nodularity less easily.

Next, palpate directly behind the nipple, during which manœuvre it should be noted whether any secretion can be expressed from the nipple (see p. 175).

Proceed in exactly the same manner on the affected side. If a lump is present note:—

*Its position*—in which quadrant of the breast. The breast occupies the interval from the 2nd to the 6th ribs. Swellings situated above or below these levels (unless in a pendulous breast) are unlikely to arise from breast tissue.

*Consistency and shape*—hard or soft, regular or irregular, and so on.

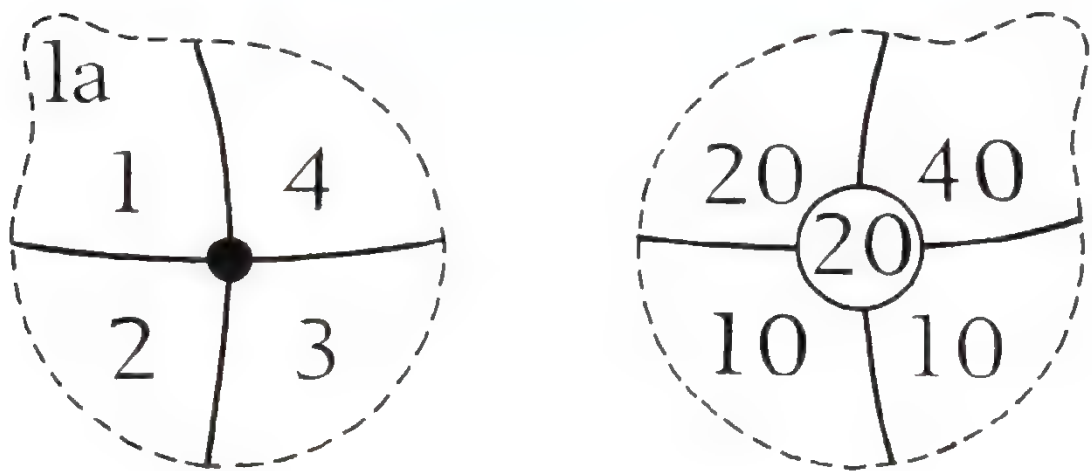
*Fixity to the skin* is tested by gently pinching up the overlying skin: this should be done systematically over the whole surface of the lump if large (Fig. 344). If

\* Many textbooks still teach that the breast should be palpated with the flat of the hand. This is much less sensitive and derives from a mistranslation of the French text of Velpeau.

small the method depicted in *Fig. 342* is better. The principal exception to the infallibility of this sign of malignancy is when the lump is situated immediately behind the nipple. A swelling in this situation, whatever its nature, is usually



*Fig. 342.*—Method of demonstrating early *peau d'orange*. Early skin-tethering can also be shown by this method.



*Fig. 343.*—(Left) The order of palpation of the quadrants of the breast. It should be noted that the upper and outer quadrant includes the axillary tail (1*a*). A lump in this region may be difficult to differentiate from an enlarged axillary lymph-node and vice-versa. (Right) The relative frequency of carcinoma in the various quadrants (approximate) and centrally.

superficially adherent, because, if it is not an integral part of the duct mechanism, some or all of the sixteen or so ducts that are about to open upon the surface of the nipple, of necessity, traverse the substance of the swelling. *Consequently, the most benign of lumps may be attached to the nipple.*

*Fixity to deep structures (the pectoralis fascia.)* Testing for attachment of a given lump to the structures underlying the breast is necessary in deciding whether the lump is malignant (although benign inflammatory masses are occasionally fixed) and in staging a carcinoma (*see p. 180*). Ask the patient to place her hand lightly upon her hip with the thumb behind; feel the pectoralis major; it is quite loose and soft. Pick up the lump between the fingers and try its mobility,



first in a horizontal, then in a vertical direction. Now ask the patient to press her hand firmly into the side, which contracts the pectoralis major (*Fig. 345*). Try the mobility of the lump once more in two planes. Note that mobility of the normal breast upon the pectoral muscle is limited to a certain extent by the full contraction of the muscle, and it requires a certain amount of experience to appreciate minor degrees of pathological fixity.



*Fig. 344.*—Testing the mobility of the skin over the lump. Areas of skin are picked up as in pinching. By this method early tethering of the skin to the lump can be detected.



*Fig. 345.*—Testing a lump in the breast for fixity to deeper structures. The patient presses her hand firmly into her side. This puts the pectoralis major into full contraction.



*Fig. 346.*—The dependent position for examination of the breasts. In this case the right breast is tethered by a scirrhus carcinoma.

Swellings towards the periphery of the lower outer quadrant lie on the serratus anterior. Ask the patient to place the hand of the affected side upon your shoulder, and to press. This contracts the serratus anterior (*see also Fig. 717, p. 414*).

**Examination of the Lymphatic Field of the Breast.**—*See p. 177.*

At the conclusion of every examination of a tumour of the breast where the signs leave little doubt as to malignancy the liver should be examined for the presence of metastases (*see p. 241*).

#### ACCESSORY METHODS OF EXAMINING THE BREAST IN SPECIAL CIRCUMSTANCES

**Examination in the Pendulous Position.**—Especially when the breasts are large and pendulous and a lump in one of them is placed deeply it is well worth requesting the patient to stand and, leaning forward, to support herself with her outstretched arms resting on the arm of a chair or a couch or on a table, according to her height. In this way the breasts can be inspected (*Fig. 346*), and palpated in the hanging position in which the greatest enemy to effective palpation of the breast tissue—namely, mammary obesity—is to some degree circumvented.

**Transillumination.**—The room must be absolutely dark and the transilluminating lamp should be capable of being made brighter or less bright at will. Fatty tissue transilluminates well; the glandular tissue of the breast less well. Cysts filled with clear or opalescent fluid are brilliantly translucent (*Fig. 349*). Most solid tumours of less than 2 cm. in diameter are moderately translucent. A cyst filled with blood, a haematoma, and dilated ducts filled with inspissated secretion or blood cast dark shadows, as do fibro-adenomata and carcinomata of 2 cm. or more in diameter. Large breasts can be transilluminated with the breasts in the pendulous position.



*Fig. 347.* This hard, rounded lump was neither attached to the skin nor to the pectoral muscle. There were no palpable lymph-nodes in the axilla. Operation showed a typical carcinoma.

**Radiology.**—Although radiological investigations and their indications are beyond our briefing some mention must be made of the value of this method in suspected breast cancer. In the presence of an undoubted lump its removal for histological examination is essential if the physical signs of cancer are not conclusively present. Only when there is doubt whether a lump is actually present (notably in a fat breast) should it be recalled that 90 per cent of breast carcinomata contain enough calcium to show up on an X-ray.

**Record of the Clinical Examination of the Breast.**—The record of the examination may be entered conveniently in the graphical manner (*see Fig. 2, p. 3*). The breast is divided into four quadrants, and a triangle represents the axilla. The clinical findings registered in this way form an accurate record that is more valuable than much description.

So ends the description of the routine examination of the breasts, with special reference to mammary carcinoma, the earliest sign of which is a comparatively small, hard lump in the breast, *unattached* to the skin and movable with the breast tissue in which it is embedded (*Fig. 347*).

#### THE CHARACTERISTICS OF NON-CANCEROUS LUMPS

**Fibro-adenosis\*** is common in women between 20 and 40 years of age, and especially in spinsters, nulliparae, and those who have not suckled a baby. Often the whole breast, indeed both breasts, are inclined to be 'lumpy' and they may be slightly tender. At other times the lumpiness is confined to a sector of the

\* Formerly known as 'chronic interstitial mastitis', a misnomer as there is no inflammation present.

breast. In still other cases there is an ill-defined lump which can be felt on palpation between the fingers and thumb in an otherwise tolerably normal breast. Such a lump is wont to be painful and somewhat tender during menstruation, whereas cancer, in the early stages, is painless.



*Fig. 348.*—Testing a lump in the breast from behind for fluctuation.



*Fig. 349.*—Appearance of a simple cyst filled with clear fluid as seen on transillumination.



*Fig. 350.*—Typical yellow-green fluid obtained on aspirating a cyst associated with fibro-adenosis.



*Fig. 351.* The phenomenon of the 'breast mouse' (a hard fibro-adenoma of the breast). Seemingly within the clasp of the finger and thumb, it slithers as would an orange-pip, to escape into a deeper part of the breast.

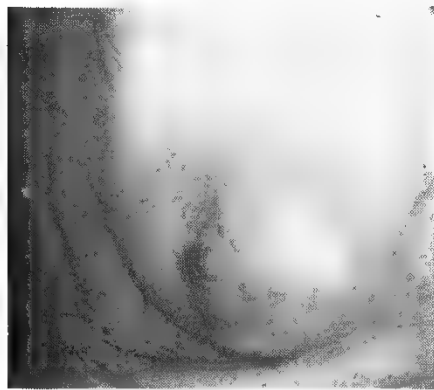
The differential diagnosis between fibro-adenosis and early carcinoma of the breast is sometimes exceedingly difficult, particularly in a large breast in which the ill-defined lump may be deeply situated. This is not surprising seeing that both these common conditions can coexist, especially in patients belonging to the later age-groups. Therefore if, after a thorough examination (including X-rays, *see p. 172*), no conclusion can be reached, it is safer to assume that a carcinoma is present, and leave the diagnosis to be settled at an early operation.

**Cyst of the Breast.**—If a history of menstrual pain suggests fibro-adenosis (the usual precursor of a cyst) endeavour to elicit fluctuation. This is best undertaken by standing behind the patient and placing the arms over the patient's shoulders. With one hand the lump is fixed; with the index finger of the other

hand (the displacing finger) fluctuation is sought (*Fig. 348*) (Riddell). In addition to a cyst, an abscess (tenderness over a chronic abscess is sometimes absent) and a lipoma of the breast, all give a positive sign of fluctuation, while in the case of a very tense cyst this sign may be absent. It is therefore desirable to follow the test for fluctuation by that of transillumination. Brilliant translucency (*Fig. 349*) is a confirmatory sign of a cyst of the breast.

**The Aspiration Test.**—If the history and physical signs suggest that the swelling is a cyst in association with fibro-adenosis an attempt should be made to aspirate it. If typical yellow-green fluid (*Fig. 350*) is found, it is excellent treatment to empty the cyst completely, after which the breast is carefully re-examined to make certain that the swelling has disappeared totally. An added precaution is to have the fluid scrutinized microscopically for cancer cells.

**Fibro-adenoma.**—Usually the patient is a woman under 30 years of age and the small lump is firm in consistency. A fibro-adenoma is rounded or ovoid; many of the larger examples are gently undulating in contour. This absolutely benign neoplasm slips beneath the fingers so readily that unless it is held between finger and thumb securely, it is liable to be lost within the breast (*Fig. 351*). Always ask the patient to secure the lump for you; as a rule she is adept at this. Even a tumour that is smooth, and when moved neither causes the slightest dimpling of the skin nor any apparent drag on the breast tissue, can prove to be a carcinoma. The patient illustrated in *Fig. 347* is a case in point, but her age was against the diagnosis of fibro-adenoma.



*Fig. 352.*—Cystosarcoma phylloides.

The firmness of a fibro-adenoma is due to the fibrous tissue it contains. As a rule the proportion is high, and the tumour is known more correctly as a *hard fibro-adenoma*; in a few cases the amount of fibrous tissue is relatively not great, and the tumour is then known as a *soft fibro-adenoma*. Soft fibro-adenomata are not infrequently bilateral, and they tend to occur in women over 30 years of age.

**Fat Necrosis.**—Many women with breast cancer state that they noticed the lump after injury to the breast. There is no doubt that trauma has drawn attention to the painless lump. Fat necrosis is indistinguishable clinically from an early carcinoma without lymph-node enlargement. In recent cases bruising of the overlying skin is a point in favour of the diagnosis of fat necrosis but can also be found with a traumatized carcinoma. Procrastination is therefore unwise, and early biopsy must be advised.

**Galactoceles.**—If the patient is, or recently has been, lactating, and a cystic swelling without obvious signs of acute inflammation is present, the *aspiration test* (*see above*) should be attempted. Milk will be drawn off and the swelling will disappear if it is a galactocoele.

**Cystosarcoma Phylloides\*** (Serocystic Disease of Brodie).—This comparatively rare condition usually first appears about a decade later than a fibro-adenoma. The striking clinical feature is a tendency to grow rapidly, and to attain great size. Nevertheless, it is surrounded by a capsule and is not nearly so malignant as its name implies. The surface of the tumour is unevenly bosselated (*Fig. 352*) with areas of softening and even fluctuation in the larger convexities. The overlying skin is thin and tense, and large veins can be seen coursing beneath it. Exceptionally, the skin becomes eroded from friction, and the tumour protrudes as a fungating mass, but as a rule it is neither adherent to the skin nor to deeper structures. On occasions there is serous discharge from the nipple. The axillary lymph-nodes are not enlarged, except secondarily to infection. In about a quarter of cases an untreated tumour becomes sarcomatous, and gives rise to distant metastases.

\* *Phylloides*. Greek, *φυλλώδης* = leaf-like. Microscopically there are branching projections of tumour tissue into cystic cavities.



**Sarcoma** accounts for about  $\frac{1}{2}$  per cent of malignant tumours of the breast. The patient is usually between 30 and 40 years of age. Often it is impossible to distinguish a sarcoma of the breast from a rapidly growing medullary carcinoma, but the softness of the tumour may suggest the possibility of sarcoma. Metastases occur early.

### A DISCHARGE FROM THE NIPPLE

When there is a history of *bleeding from the nipple*, it is not exceptional for the patient's vest to show tell-tale evidence (Fig. 353). Therefore look at that part of the under-garment or brassière that has been in contact with the nipples prior to the examination. Apart from the serosanguineous discharge that comes from the denuded skin in cases of advanced Paget's disease of the nipple and a scanty seropurulent discharge that oozes from a cracked nipple, the discharge comes from a lactiferous duct.



Fig. 353.—Duct papilloma of the breast with retention cyst. Pressure over the cyst causes a blood-stained discharge to appear at the nipple. (The blood-stain on the patient's vest was present before the examination was commenced.)



Fig. 354.—Acute mastitis in a male infant.

Such a discharge can be bright red blood, dark altered blood, yellow serous fluid, green-coloured fluid, opalescent fluid, and occasionally crystal-clear fluid. Opalescence can be due to milk or pus. It is therefore extremely important to be furnished with a glass slide so that if the opportunity presents to collect a drop, or several drops, of the fluid expressed, the specimen can be examined for the presence of red blood-cells, cancer cells, and pus cells.

*A Discharge of Bright Red Blood* is due most frequently to a benign duct papilloma, but it can result from a duct carcinoma, and rarely from carcinoma occurring in a lactating breast. Diagnosis depends therefore not upon the presence of a discharge, but what can be learned from palpation of the breast, from transillumination, and on microscopical examination of the discharge (Geschickter).

*A Discharge of Dark Altered Blood* is frequently the result of a duct papilloma causing obstruction to a duct, and the blood becoming pent up for a varying period.

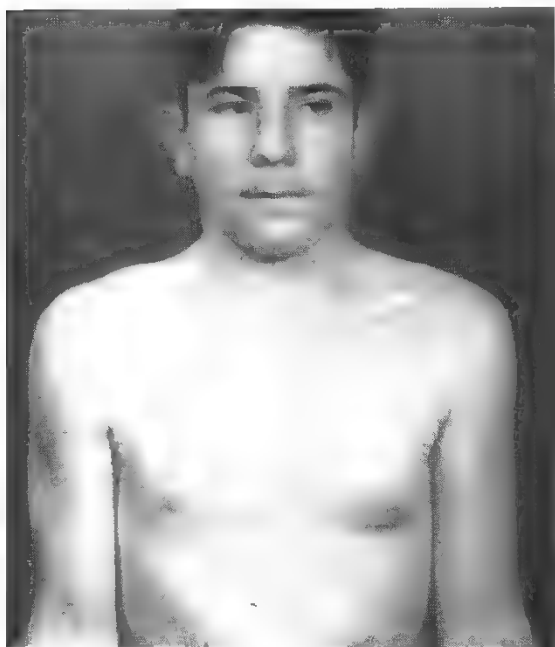
*A Discharge of Slightly Blood-stained Fluid* in the presence of a sizeable cystic swelling in one quadrant of the breast strongly suggests an intracystic papilliferous carcinoma (Disease of Réclus), a rarity.

*A Discharge of Clear Yellow Serous Fluid* with a lumpy breast is almost certainly due to fibro-adenosis with retention cysts.

*A Thick Green Discharge* is not at all uncommon. It is due to *duct ectasia*, i.e., generalized dilatation of the major lactiferous ducts.

*A Milky Discharge* can continue after weaning. Its presence is an indication for more efficient suppression of lactation.

In every cases of discharge from the nipple the whole breast is palpated in the usual manner. If no lump or other striking abnormality is detected, or when pressure over a segment of the areola (*Fig. 353*) does not readily produce a bead of discharge, the breast is held firmly against the chest wall by an assistant in such a way as to stretch the areola transversely, while the clinician presses the edge of the areola with his finger in a 'round the clock' manner. As a rule the bead exudes from one duct only.



*Fig. 355.*—Mastitis of puberty.

**Transillumination** in a case of duct papilloma may reveal an opacity in the line of the duct due to pent-up blood, if the test is performed before this collection of blood is expressed (Moore).



*Fig. 356.*—Acute mammary abscess.

### ACUTE INFLAMMATIONS OF THE BREAST

**Mastitis of Infants.**—The diagnosis of acute mastitis of infants is obvious by inspection alone (*Fig. 354*). On the third or fourth day of life, if an infant's breast is pressed lightly a drop of colourless fluid can be expressed. A few days later there is often a slight milky secretion which finally disappears during the third week. This is popularly known as 'witch's milk'. The explanation is that the hormone stimulating the mother's breasts reacts also upon the mammary tissue of the foetus. The condition is as common in the male as in the female. This physiological activity

may lead to true mastitis by retrograde infection. Even so, usually it resolves; occasionally suppuration ensues.

**Mastitis of Puberty** (*Fig. 355*).—One breast is tender, slightly swollen, and inflamed. Curiously, the condition is usually seen in boys and is hardly ever bilateral.

**Mastitis of Mumps** occurs in both sexes. Usually it is unilateral.

**Bacterial Mastitis of Adult Women** of child-bearing age is by far the most common variety. It usually occurs when lactation has been inefficiently suppressed. Only occasionally is it bilateral. A few cases are seen in non-lactating women.

It frequently goes on to suppuration (*Fig. 356*). The affected breast, or more usually mainly one quadrant, presents the classic signs of acute inflammation. Examine the nipple carefully for a crack or abrasion, a finding that is comparatively rare. Most breast abscesses are due to staphylococci entering the lactiferous ducts: such infection is favoured by a retracted or poorly developed nipple. Palpate the inflamed breast with extreme gentleness, the object being to ascertain which portion is most indurated, for there will lie the maximum purulent accumulation. In late cases fluctuation may be obvious. When the breast is not as tender as might be expected, but the induration is greater and the history is somewhat prolonged, it is expedient to try to eliminate the possibility of mastitis carcinomatosa, that galloping cancer of young, or pregnant, or lactating women.

*Subareolar Mastitis* results from an infected gland of Montgomery (*see Fig. 339*) or a furuncle of the areola.

### CHRONIC ABSCESS OF THE BREAST

**Chronic Intramammary Abscess** is often a very difficult condition to diagnose. When encapsulated within a thick wall of fibrous tissue it cannot be distinguished clinically from a carcinoma, skin tethering or *peau d'orange* being present.

In countries where tuberculosis is rife, tuberculosis of the breast is not rare. When a patient presents with a purulent sinus connected with a breast abscess and enlarged axillary lymph-nodes consider the possibility of tuberculosis. If there are no enlarged lymph-nodes think of actinomycosis (*see p. 40*).

**Chronic Subareolar Abscess** usually is associated with retraction of the nipple, and unless the retraction is remedied the condition recurs time and again, in spite of incision of the abscesses.

**Mammary Fistula** (Atkins) presents as a recurrent abscess that points and discharges on to the areola, and continues to discharge for weeks at a time. It is due to a fistula of a lactiferous duct.

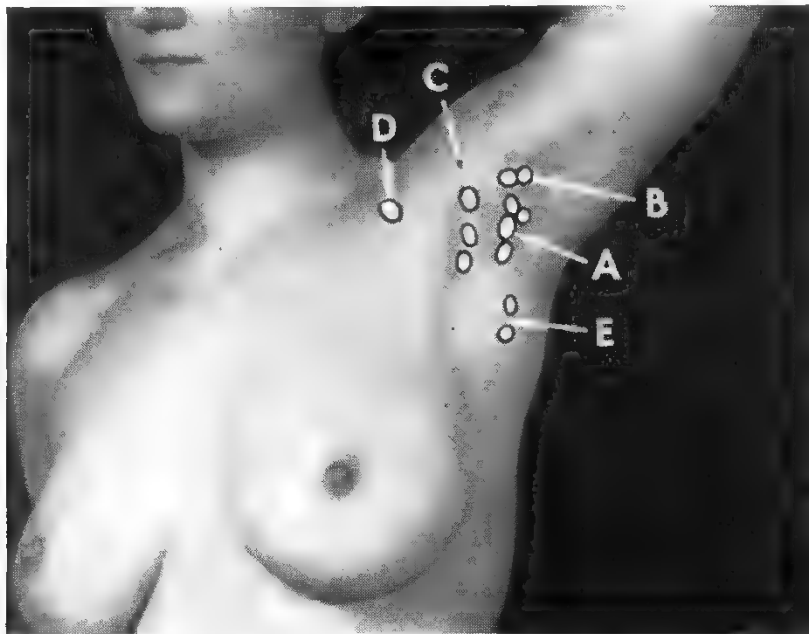
### EXAMINATION OF THE AXILLARY LYMPH-NODES

The patient should be seated as for examination of the breast. The right axilla is palpated with the left hand, and vice versa. In all patients with suspected breast disease *both* axillae must be examined. Let us assume that the left axilla is to be palpated first. The various groups of lymph-nodes are illustrated in *Fig. 357*. A, B, and C are palpated from in front, while D, E, and the supraclavicular lymph-nodes (not shown in *Fig. 357*) are palpated from behind the patient.

**The Central Group** (*Fig. 357 A*).—Raise the patient's arm from her side, and pass the extended fingers of the right hand high up into the apex of the axilla, directing the palm towards the lateral thoracic wall (*Fig. 358*). The patient's arm is now brought to her side, and the forearm rests on the examiner's forearm, the arm hanging loosely in this position (*Fig. 359*). The non-examining hand is now free to be placed upon the patient's right shoulder, and serves to steady and control

subsequent manœuvres. To make certain that the highest limit has been reached, once again the fingers in the axilla are pressed upwards. The hand should then be cupped, and the finger-pulps pass downwards with a firm, sliding movement, until they are well below the level of the axillary outlet.

When one or more of the central axillary lymph-nodes are enlarged, they will be felt momentarily imprisoned between the thorax and the examining fingers (*Fig. 360*): the number, size, consistency, and mobility or fixity are noted.



*Fig. 357.*—The axillary lymph-nodes from a clinical standpoint and the order in which they are palpated. A, Central group; B, Lateral axillary group; C, Pectoral group; D, Infraclavicular group; E, Subscapular group.

**The Lateral Axillary Group** (*Fig. 357 B*).—The axillary group lies on the axillary vein, and the most lateral nodes of this group lie distal to the pectoralis minor, where they are comparatively accessible. Raise the arm again, this time slowly, and while raising the arm (and lowering it, if necessary, until the optimum position has been reached) palpate around and beneath the insertion of the pectoralis major for an enlarged node lying on the third part of the axillary blood-vessels.

**The Pectoral Group** of lymph-nodes (*Fig. 357 C*) is next examined. The patient's arm is elevated, and the fingers are insinuated beneath the pectoralis major. This time the pulps of the fingers are directed forwards. On lowering the arm as shown in *Fig. 359* the pectoralis minor muscle frequently can be detected, and between the two muscles are situated the pectoral nodes.

**Infraclavicular Group** (*Fig. 357 D*).—Enlargement of lymph-nodes lying on the clavipectoral fascia should be suspected when there is obliteration of the infraclavicular hollow or where there is unilateral prominence of veins in this region. The area is palpated and compared with that of the opposite side.

**Subscapular Group** (*Fig. 357 E*).—These, lying on the posterior axillary fold, are best examined from the back (*Fig. 361*). Standing behind the patient, the examiner palpates the antero-internal surface of the latissimus dorsi, and if these lymph-nodes are enlarged they will be found at the bottom of the fold. The apex



of the axilla should also be palpated from this aspect, which gives good access to the more posterior of the central group of lymph-nodes.

**Examination of the Supraclavicular Fossae.**—See p. 140.

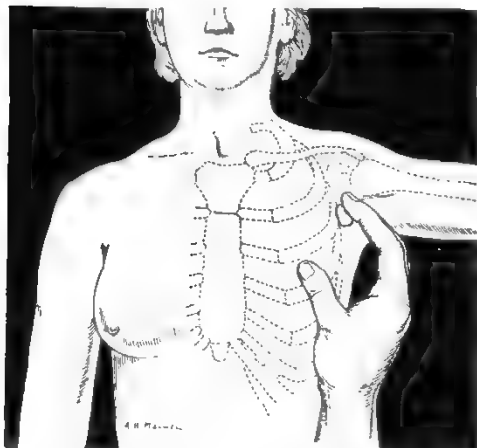
**Conclusions.**—The findings should be recorded graphically. Indurated enlargement of a lymph-node or nodes in any of the groups detailed above signifies that



*Fig. 358.*—Examining the axilla (I). The arm is raised, and the fingers are inserted as high as possible.



*Fig. 359.*—Examining the axilla (II). Note that the patient's arm rests comfortably over the examiner's forearm.



*Fig. 360.*—A node high in the axilla momentarily imprisoned between the thorax and the examining fingers.

metastasis has occurred, and if the enlarged node is tethered, the eventual prognosis is poor. One must be mindful that lack of palpable evidence of lymph-node involve-

ment is no guarantee that metastasis has not occurred. Indeed, in approximately 50 per cent of cases of carcinoma of the breast with impalpable lymph-nodes



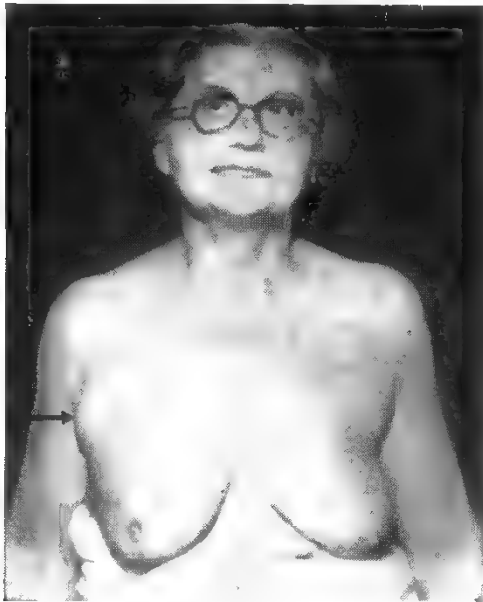
*Fig. 361.*—Examining, from the back, the subscapular lymph-nodes lying in the posterior fold of the axilla.

histological scrutiny of the specimen obtained by regional block dissection shows a carcinomatous deposit in one or more of the nodes removed. It must also be mentioned that the chain of lymph-nodes along the internal mammary vessels is not clinically accessible.

Another important fact is that shotty enlargement of the axillary lymph-nodes often occurs in fibro-adenosis of the breast.

Sometimes it is difficult to be sure whether a given lump is situated in the axillary tail of the breast, or whether it is due to metastases in the lowermost of the pectoral group of nodes (*Fig. 362*).

When the axillary lymph-nodes are the seat of bacterial invasion (often due to an infected lesion of the hand or arm) they are wont to break down and form an axillary abscess (*Fig. 363*).



*Fig. 362.*—Massive secondary involvement of the lowermost pectoral group of lymph-nodes. There is a primary neoplasm visible in the breast proper, causing retraction of the right nipple.



*Fig. 363.*—A tender swelling under the left pectoralis major is present. Temperature raised. Subpectoral abscess.

#### CLINICAL STAGING OF BREAST CANCER

It is insufficient to diagnose carcinoma of the breast. To advise appropriate treatment suitable for a given patient, the surgeon should estimate how early or advanced is the growth. From this more refined diagnosis the average prognosis can be deduced.

Two forms of clinical staging are in use, the first simpler, but the second more desirable by virtue of the greater detail possible.

*The International Classification.*—Four stages are recognized:—

I. A lump is present, perhaps with slight tethering to the skin. Paget's disease without lymph-node enlargement falls into this category.

II. In addition, there are mobile enlarged lymph-nodes in the ipsilateral axilla, or the nipple is recently retracted, or the lump is tethered to the skin.

III. The tumour is extensively adherent to skin (including *peau d'orange*), or to underlying muscle, or is ulcerating, or ipsilateral nodes are fixed.

IV. There are distant metastases (including skin nodules), contralateral or supraclavicular nodes, or a lump in the opposite breast, or liver, bone, or lung metastases.

*The T.N.M. Classification* has been sponsored by the International Union Against Cancer. **T** refers to the characteristics of the tumour, **N** of the lymph-nodes, and **M** denotes the presence or absence of metastases.

T<sub>1</sub>. Size 2 cm. or less with no fixation or nipple retraction. Paget's disease with a lump showing these characteristics is included.

T<sub>2</sub>. Tumour more than 2 cm. diameter but less than 5 cm., or less than 2 cm., but with tethering of overlying skin or retraction of nipple.

T<sub>3</sub>. Tumour more than 5 cm. diameter but less than 10 cm., or less than 5 cm. with infiltration or ulceration of skin, or *peau d'orange* over tumour, or fixation to muscle.

T<sub>4</sub>. Any size tumour with infiltration or ulceration of skin wide of tumour, or *peau d'orange* wide of tumour, or chest-wall fixation, or tumour larger than 10 cm.

N<sub>0</sub>. No palpable axillary lymph-nodes.

N<sub>1</sub>. Axillary lymph-nodes, palpable but mobile.

N<sub>2</sub>. Axillary lymph-nodes, fixed to each other, or to other structures.

N<sub>3</sub>. Supraclavicular lymph-nodes movable or fixed, or oedema of arm.

M<sub>0</sub>. No evidence of distant metastases.

M<sub>1</sub>. Distant metastases including skin wide of breast, opposite breast or nodes, or other metastases.

Note that the growth is given the highest number in each series which can be applied. Thus the lesion depicted in *Fig. 347* would be staged T<sub>1</sub>, N<sub>0</sub>, M<sub>0</sub>, while that in *Fig. 362* would be T<sub>2</sub>, N<sub>2</sub>, M<sub>0</sub>. It is a good exercise for the student to work through the illustrations of breast cancer in this chapter and stage them as far as the data allow.

### THE MALE BREAST

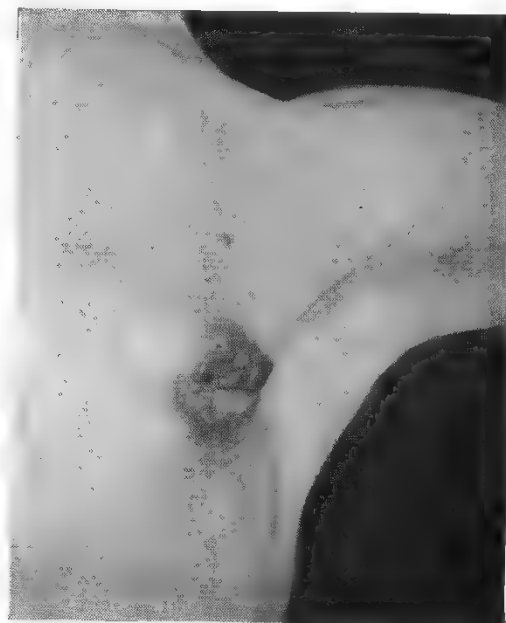
The examination of the male breast is carried out in the same manner as in the female.

**Mastitis.**—Reference has been made already to the frequency with which mastitis of infants and mastitis of puberty affect males.

In adults traumatic mastitis is not uncommon among soldiers carrying heavy equipment strapped across their shoulders.



*Fig. 364.*—Oestrogen gynecomazia following treatment of carcinoma of the prostate.



*Fig. 365.*—Carcinoma of the breast in a man who did not report it until the skin became ulcerated and painful. In male patients this delay in seeking advice is the rule, rather than the exception.

#### Gynecomazia.—

*a. Idiopathic.*—Hypertrophy of the male breast may be unilateral or bilateral. The breast (or breasts) enlarges at puberty, and sometimes presents the characteristics of a moderately developed female organ.

*b. Hormonal.* Enlargement of the breasts has often accompanied oestrogen therapy,\* particularly for carcinoma of the prostate (*Fig. 364*). Hormonal gynaecomazia can also occur as a result of a teratoma or a chorionepithelioma of the testis, in anorchism, and after castration. In *leprosy* it is likely that testicular atrophy is the cause of the gynaecomazia commonly seen. The contents of the scrotum must therefore always be examined.

*c. Associated with Portal Cirrhosis.*—Gynaecomazia sometimes occurs in patients with liver damage which results in incomplete destruction of circulating oestrogens thereby stimulating the breast to hypertrophy. The liver should always be examined.

**Fibro-adenosis** is not infrequent in men. It can occur on one or both sides. In unilateral cases fibro-adenosis can be distinguished from carcinoma by the occurrence of a small disk-shaped, movable, firm, tender swelling beneath the areola. Usually the tenderness diminishes after two months and the hypertrophy is all but gone in six months.

**Fibro-adenoma** is not exceedingly rare, and presents the same clinical features as in the female (*see p. 174*) except that the lump is not elusive in the small male breast.

**Carcinoma**, which accounts for about 1 per cent of all cases of carcinoma of the breast, has an evil reputation: many cases are far advanced when the patient first presents. Primarily this is due to the fact that so often the patient does not seek advice for months or years (*Fig. 365*). Secondly, the breast is so small that the enlarging growth reaches the extramammary tissue much sooner than in the female: this favours earlier metastasis. On the other hand, the signs of malignancy (hardness of the lump, skin tethering, *peau d'orange*, and fixity to muscle, *see pp. 168–71*) are more easily detected.

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\* Unprotected workers engaged in the manufacture of oestrogens are liable to develop gynaecomazia.



## CHAPTER XVI

## THE THORAX (INCLUDING OESOPHAGUS)

THE thorax is considered fully in medical works so no purpose would be served by embarking upon a detailed consideration of physical signs connected with lung and heart disease. Attention will therefore be focused on particular points significant to the surgeon.

First consider a condition of such great urgency that the patient's life is hanging in the balance, and the chances of recovery rest largely upon the clinician's diagnostic acumen and prompt action.

**Laryngeal or Tracheal Obstruction.**—Stridor,\* dyspnoea, cyanosis, and restlessness (fighting for breath) are cardinal signs of obstruction of the major air-passage. The larynx moves forcibly up and down with respiration and, especially in an adult, the accessory muscles of respiration can be seen to contract violently with each attempted inspiration (*see Fig. 376, p. 188*). Simultaneously the distended jugular veins become empty and indrawn, only to billow forth again when inspiratory gives place to expiratory effort. On baring the thorax another characteristic sign is seen:—

**The Sign of Recession.**—The lower end of the sternum, together with the adjacent costal framework, the supraclavicular fossae and epigastrium, is sucked in during inspiration. This is especially noticeable in young children, e.g., in diphtheria, now a rarity. In older children and adults, owing to the greater rigidity of the chest wall, gross recession is rarely in evidence, but retraction of the intercostal spaces usually is evident in comparatively thin subjects. Considerable and consistent recession is a sure guide that tracheostomy is required urgently, except where the patient is recovering from an anaesthetic and is still under the effects of a muscle relaxant.

## THORACIC DEFORMITIES

Much information can be obtained from general inspection of the thorax, and an astute surgeon will not fail to notice the thoracic build and respiratory expansion of the patient in every relevant case. Chronic bronchitis is a pointer to the likelihood of complications after anaesthesia, particularly atelectasis (*see p. 197*).

**Pectus Excavatum** (funnel chest) is not due to rickets, but to a congenital deficiency in the muscular component of the diaphragm (Brodkin). Often the deformity is hereditary. This causes the xiphi-

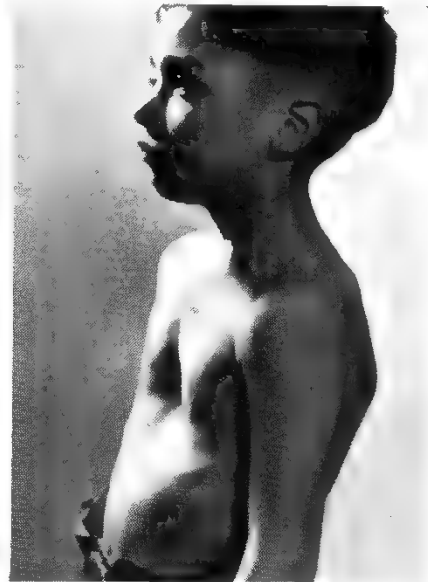
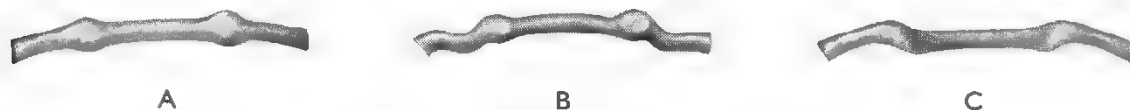


Fig. 366.—Pectus excavatum (funnel chest).

\* *Stridor* is a harsh noise produced as respiratory air passes through a partially obstructed main air-passage.

sternum to be pulled in by the muscles opposing the diaphragm, notably the intercostals, each time the diaphragm descends. In course of time the inspiratory depression becomes a fixed irreversible deformity (*Fig. 366*) which, if severe, causes the patient to suffer from dyspnoea on exertion and renders him liable to respiratory infection. By pressure upon the heart, funnel chest sometimes causes a systolic murmur and degrees of exertion intolerance, which have been mistaken for heart disease. Rarely more serious effects are observed, culminating in heart failure.

**Pectus Carinatum** (pigeon chest) is a keel-like protuberance of the body of the sternum, also congenital in origin.



*Fig. 367.*—Deformities of the sternocostal junction. **A**, Rickety rosary; **B**, Harrison's sulcus; **C**, Scorbutic rosary.

**Deformities of the Sternocostal Junction.**—The rachitic chest, resulting from impaired mineralization of bone consequent upon vitamin-D deficiency, is first seen in infants between 6 and 18 months of life as a **rickety rosary**, produced by bead-like enlargement of the ribs at their junction with their cartilages (*Fig. 367 A*).

Later the softened ribs encourage the development of a **Harrison's sulcus**. This groove occurs at the costochondral junction (*Fig. 367 B*), the lower ribs appearing caved in.

The **Scorbutic Rosary** due to vitamin-C lack differs from that produced by rickets in that the sternum is displaced backwards (*Fig. 367 C*).



*Fig. 368.*—Slipping rib.

**Slipping Rib.**—The pain is referred to the exact position of the incompletely tethered rib, usually the 10th, the cartilage of which can be moved upwards so as to override the 9th (*Fig. 368*), and this movement causes pain. Usually the patient is a young woman.

### CLUBBING OF THE FINGERS

This (*Fig. 369*) is a sign of chronic anoxia from any cause; it is important to the surgeon in assessing the patient's fitness for anaesthesia. It is frequently present in patients with bronchiectasis and, as Hippocrates described, in those with a chronic discharging empyema sinus. It is also seen in those suffering from

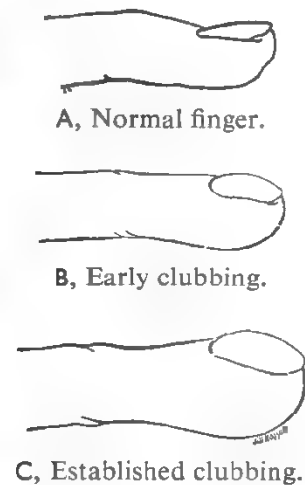
EDWIN HARRISON, 1779–1847, *Physician, St. Marylebone Infirmary, London.*

HIPPOCRATES, born on the Island of Cos about 460 B.C., is justly regarded as the *Father of Medicine*.

advanced (notably congenital) heart disease. In these conditions over-curving of the nails is the result of bulbous enlargement of the nail-beds with, in later cases, lateral expansion of the terminal phalanx resulting in a drumstick appearance. In established cases of clubbing the finger-nails are curved longitudinally like a parrot's beak. *Hypertrophic pulmonary osteo-arthritis* consists of clubbing, together with symmetrical swelling of joints (particularly the ankles, wrists, or knees) which feel hot on palpation. The most common cause (80 per cent) is bronchial carcinoma, in 6 per cent of which it occurs.



Fig. 369.—Clubbing of the fingers.



### METHOD OF COUNTING RIBS

Often it is necessary to know which rib is injured or diseased. Running the finger downwards from the suprasternal notch, a transverse ridge can be felt, and often seen—the angle of Louis (sternal angle). The finger, moved to the side along this ridge, will pass directly on to the second rib. Ribs are counted from this point (Fig. 370). Posteriorly, ribs may be counted upwards, starting with the 12th, which can usually be felt, but in obese individuals only with difficulty. When the arm rests by the side, the lower angle of the scapula lies upon the 7th rib. The spine of the scapula lies over the 3rd rib or 3rd intercostal space, but the scapular surface markings are not absolutely reliable guides.

### THORACIC INJURIES

Injuries of the thorax occur frequently and severe injuries are seen increasingly with motor-car accidents.

**Fractured Rib.**—Ask the patient, who is stripped to the waist, to take a deep breath. If a rib or ribs are fractured, pain is likely to be experienced in the region of the fracture before the zenith of inspiration, and he at once clasps a hand to the injured part in an endeavour to support it. Careful palpation along each rib in this region will often reveal local tenderness and evidence of a breach of bony continuity, especially in a thin subject. Such evidence is occasionally more reliable than a radiograph. In fat or muscular individuals, particularly when the fracture is situated somewhere in the middle ribs (quite a common situation), the compression test is valuable.

ANTOINE LOUIS, 1723–1792, *Surgeon, Hôpital Charité, Paris*. A notorious achievement was to perfect the guillotine, which was first used in 1792 in the execution of a highwayman. Some attribute the description of the angle of Louis to PIERRE LOUIS, 1787–1872, *Physician, Hôpital la Pitié, Paris*.

*The Compression Test.*—The base of one hand is placed over the sternum, and the base of the other over the spine; the thorax is then gently compressed *antero-posteriorly* (Fig. 371). When a rib has been fractured this manœuvre causes pain at the site of the lesion.

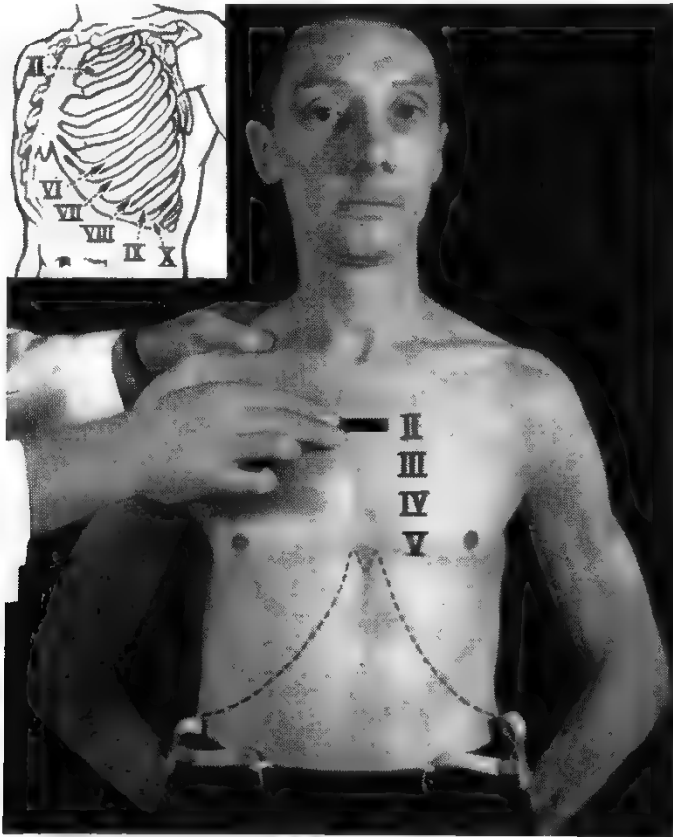


Fig. 370.—Method of counting ribs. The angle of Louis is found; this is opposite the second costal cartilage. Bearings are taken from this point.

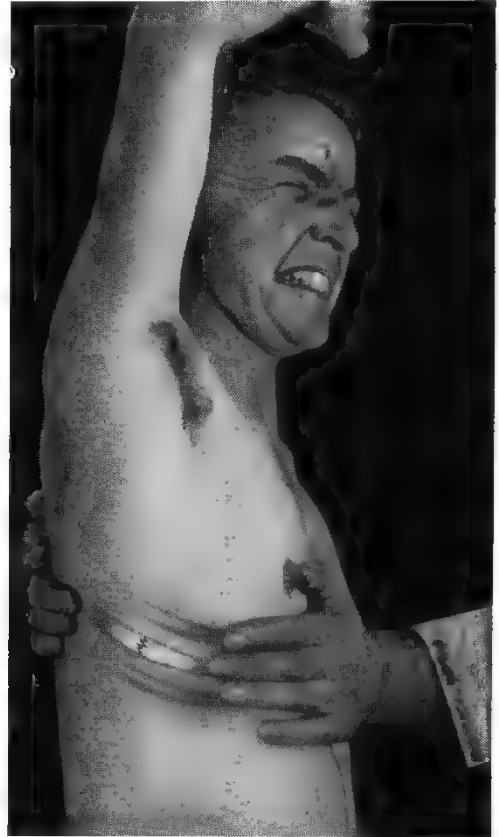


Fig. 371.—The compression test for fractured rib. Commence with 'fairy-like' pressure.

In every case of fractured rib the clinician must keep a sharp look-out for signs of concomitant injury of a lung (*see below*), and on the left side for signs of a rupture of the spleen (*see p. 332*), which are also sometimes delayed.

**Fracture of the Sternum.**—The posture is characteristic: the body is bent forwards with the shoulders rotated inwards, and the head held forwards and downwards. Thanks to the comparative accessibility of the sternum to the palpating fingers, the deformity associated with a fracture of this structure is usually detected without difficulty. The spinal column must be examined for a concomitant injury (*see p. 221*).

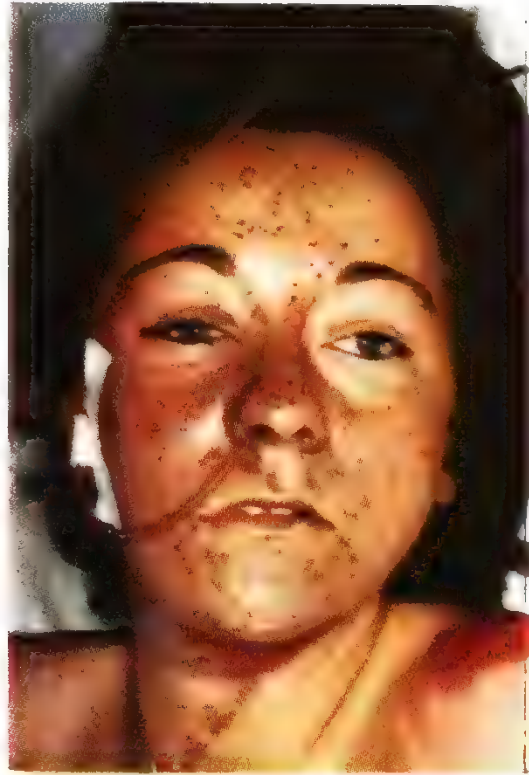
**Injury of a Lung.** There are two early signs, the presence of either of which leaves no doubt that the underlying lung has been implicated in the injury. The first is *haemoptysis*: if even a small quantity of frothy bright-red blood is expectorated it is proof that contusion or laceration of lung tissue with escape of blood into the alveoli or bronchioles has occurred. In every case of thoracic injury an early question should always be, 'Have you coughed up any blood?'

The second is the presence of *subcutaneous emphysema*. The physical characteristics have been described on p. 16. Following a thoracic injury it can make its appearance in two ways: (a) As a result of traumatic rupture of pulmonary tissue air passes beneath the visceral pleura to the hilum of the lung, and thence, via the

mediastinum, it appears in the neck. Extreme instances of this variety are to be seen when a wound or rupture of the trachea or large bronchus allows a communication to exist with the areolar tissue of the mediastinum. Quickly the whole of the subcutaneous plane of the neck and face becomes distended with air. (b) Following laceration of the adjacent lung by a fractured rib or by a stab wound (*Fig. 372*)



*Fig. 372.*—Massive subcutaneous emphysema involving the scrotum, the neck, and the face, resulting from a stab wound of the thorax above the right nipple.



*Fig. 373.*—Traumatic asphyxia, following a traffic accident.

emphysema appears over the site of injury and spreads for a varying distance around the site of fracture. This variety of subcutaneous escape of air may or may not be associated with a pneumothorax.

*Contusion of the lung* may lead to the signs of pneumonia a few days after an injury. This diagnosis is beyond our province.

**Haemothorax and Haemopneumothorax** are common complications of compression injuries of the thorax with fracture of a rib or ribs. Sometimes the onset is insidious, and consequently the possibility of blood or air (frequently in combination) accumulating in the pleural cavity should be suspected for three or four days, even after a fracture of a single rib. Reliable signs for their detection are dullness on percussion in the case of haemothorax, hyper-resonance above this in the case of haemopneumothorax, and absence of breath-sounds. Signs of shock (*see p. 43*) are present if blood-loss has been sufficient. The diagnosis must be confirmed by the typical radiological appearances.

**Traumatic Asphyxia** occasionally complicates compression injuries of the thorax. Petechial haemorrhages, due to extravasation of blood from compressed venules, are seen in the skin, confined mainly to the face and neck, although they may be seen to a lesser extent on the thorax. The conjunctivae are bright red from conjunctival haemorrhages (*Fig. 373*). In rare severe instances the face is purple.



**Stove-in Chest.**—Several ribs are fractured with a resulting local indentation of the chest wall. If this lesion is uncomplicated by flail chest (*see below*), its efforts on respiration are not severe. Blood-loss may be marked.

**Flail Chest.**—A crushing injury resulting in comminuted fractures of three or more ribs, each with a fracture posteriorly *and* at, or near, the costochondral junction, causes a flail chest. An even more dangerous variant is when a number of ribs or costal cartilages are fractured on either side near the sternum, rendering

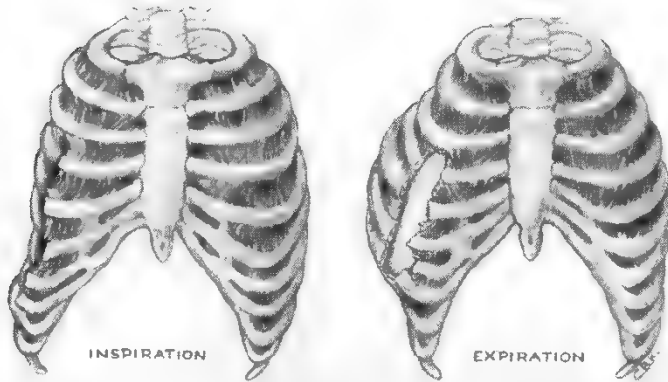


Fig. 374.—Paradoxical respiration. The comminuted fractured ribs are displaced inwards during inspiration and outwards on expiration or cough.

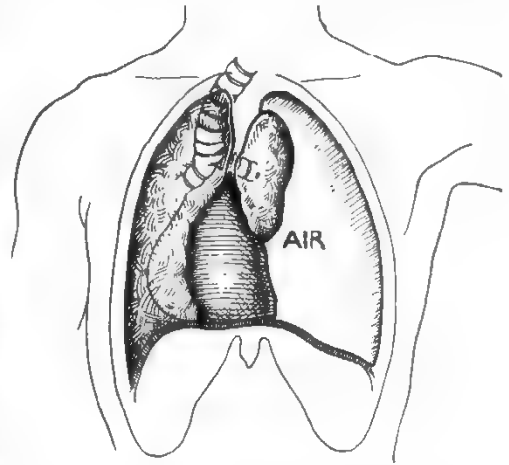


Fig. 375.—Tension (valvular) pneumothorax showing displacement of the mediastinum and trachea.

the sternum flail. In either case the flail segment is sucked in during inspiration and driven out during expiration; the breathing is therefore paradoxical, the injured side of the thorax moving in while the uninjured side moves out (Fig. 374). This results in air being shunted from the injured to the uninjured side and back

again, rather than being exhaled, with progressive accumulation of carbon dioxide which, together with loss of effective cough and resulting accumulation of tracheobronchial secretions, produces unmistakable dyspnoea and cyanosis. The increasing anoxia and carbon-dioxide retention result in increased dyspnoea and more pronounced paradoxical movement with rapid deterioration of the patient's condition—a vicious cycle that can be broken only by urgent appropriate treatment.



Fig. 376.—Blast injury. Appearance of the chest in full inspiration, showing fullness of the lower thorax and overaction of the accessory muscles, notably the sternomastoid.

**Tension (Valvular) Pneumothorax.**—Blood as well as air is extravasated into the pleural cavity, but the air decidedly predominates. The cause is laceration of the lung communicating with a branch of the bronchial tree. This permits air to enter the pleural cavity from the lung during inspiration, but it does not permit its escape during expiration—hence the term 'valvular'. Increasing dyspnoea and cyanosis are leading features. Absence of breath-sounds,

hyper-resonance, cardiac displacement, pallor, and poor pulse are classic signs. As the air accumulates in the pleural cavity, so the mediastinum and trachea tend to become more and more displaced (*Fig. 375*).

**Blast Injuries** due to high explosives are borne, to a great extent, by the lungs. In patients who survive, the symptoms and signs are few: consequently, the condition may be overlooked, especially when other lesions are in evidence. Always suspect the presence of lung injury in every patient involved in an explosion. An expanded appearance of the lower chest is a fairly regular accompaniment (*Fig. 376*).

**Open Wounds of the Thorax.**—A 'sucking' wound of the thorax indicates that the pleura has been opened. Bloody froth issuing from the wound, coupled with respiratory distress, suggests a tension pneumothorax.

**Heart Tamponade.**—In a penetrating wound of the pericardium the heart will almost certainly be wounded, in which case bleeding will occur into the pericardium (*Fig. 377*). Sometimes this gives rise to a precordial bulge. As the amount of blood in the pericardium increases so, *pari passu*, is the heart compressed, and the circulation fails correspondingly. The pulse-rate becomes faster and the pulse pressure progressively weaker. Pulsus paradoxus is present, i.e., the pulse feels weaker when the patient inspires. The veins of the face and neck become engorged, and the dimensions of the area of cardiac dullness increase. The heart-sounds are faint and muffled on auscultation. This condition occasionally occurs with a closed injury.



*Fig. 377.*—Heart tamponade.

**Contusion of the Heart.**—After a blunt injury to the front of the chest, the patient complains of precordial pain and weakness; a low blood-pressure is noted without the other signs of tamponade mentioned above. An electrocardiogram will show the changes of coronary thrombosis and a physician should be asked to interpret this and manage the case.

**Traumatic Rupture of the Aorta.**—This serious injury is becoming commoner in this age of traffic accidents. A proportion of patients reach hospital alive in severe shock and, if conscious, complaining of intense chest pain which may be attributed to concomitant fractured ribs. Radiography is essential for diagnosis but Powley has described an important physical sign which may be observed during the time necessary to arrange arteriography; as the mediastinal haematoma spreads to the root of the neck, the neck measurement may increase by as much as 10 cm. in 2–3 hours. The normal size of the neck is obtained from the patient's shirt collar.

## SOLID SWELLINGS OF THE THORACIC CAGE

**Non-specific Costochondritis** (Tietze's Disease) constitutes a common entity. The patient, in civil life nearly always a woman, complains of a varying painful swelling of the chest wall. More often than not she considers that the lump is in the breast, and this is the real cause of the concern, which may be shared by her medical attendant. The most common cartilage to be affected is the second. On careful palpation it becomes quite evident that the swelling in question is caused by an expansion of the cartilage as it joins the rib. This disease also occurs in military recruits in whom it appears to result from carrying heavy equipment strapped to the chest.

**Tuberculous Costochondritis.**—Only a very small proportion of cases prove to be tuberculous. Unless the patient has other evidence of tuberculosis, shows a positive dermal test, or has a swelling that is larger and more defined than a diffuse expansion of the costochondral junction, it is impossible to diagnose the tuberculous variety in its early stages, for there are no characteristic radiological changes. Later, the presence of fluctuation (cold abscess) makes diagnosis easier.

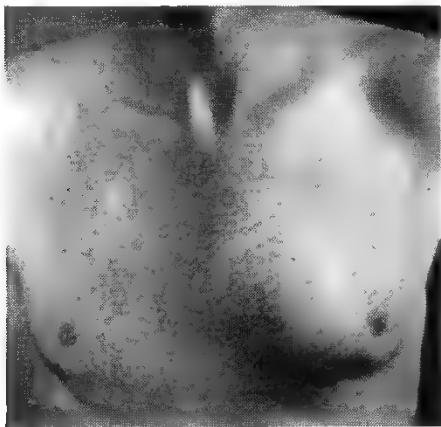
**A Neoplasm of that Portion of a Rib lying beneath the Breast** also causes apparent enlargement of the breast. *Fig. 378* shows a case in point. If the hand be placed over the breast the whole breast will be found to be movable on the swelling behind it; this is the method by which is settled the important question, 'Is the swelling in, or behind, the breast?'

**Neoplasm of the Rib.**—If it is remembered that swellings involving the skin and soft tissues (e.g., sebaceous cyst, p. 22, lipoma, p. 23) can occur in the chest wall, it becomes comparatively easy to recognize that a bony hard swelling lies in the long axis of a rib and is expanding the rib. Confronted with a hard swelling of a rib which is unlikely to be caused by excessive callus around a fracture, one should ask oneself the basic question, 'Is this neoplastic swelling primary or secondary?' In practice the great majority are secondary.

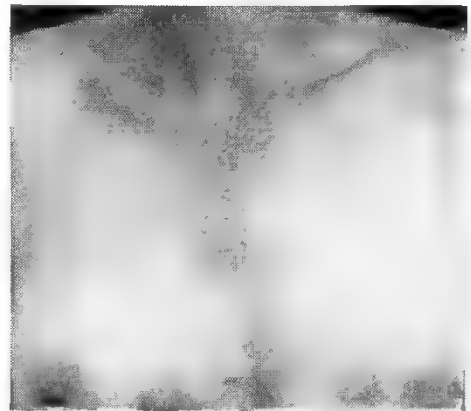
**Secondary Carcinoma of a Rib** is associated particularly with primary carcinoma of the breast or of the bronchus (*Fig. 379*), but it can originate from any primary, particularly those mentioned on p. 435. Pain and local tenderness are marked and may be present long before a swelling is manifest. Spontaneous fracture of a rib, the seat of a secondary carcinoma, occurs rather frequently.



*Fig. 378.*—A tumour of the rib causing apparent enlargement of the breast. It proved to be a chondrosarcoma.



*Fig. 379.*—Secondary carcinoma of the left 5th rib in a patient with carcinoma of the bronchus.



*Fig. 380.*—A secondary deposit in the sternum. The patient had complained of painless haematuria for some months. Case of carcinoma of the kidney.

**Primary Rib Tumours** are not rare. The conditions considered on pp. 433, 434 can occur. Chondrosarcoma (*Fig. 378*) is the commonest. If a primary source cannot be found, a rib swelling should be removed or biopsied to provide a histological diagnosis.

Neoplasms of the Sternum are considerably less frequent than those of the ribs. Secondary tumours are much more likely (*Fig. 380*). Primary tumours are distinctly rare.

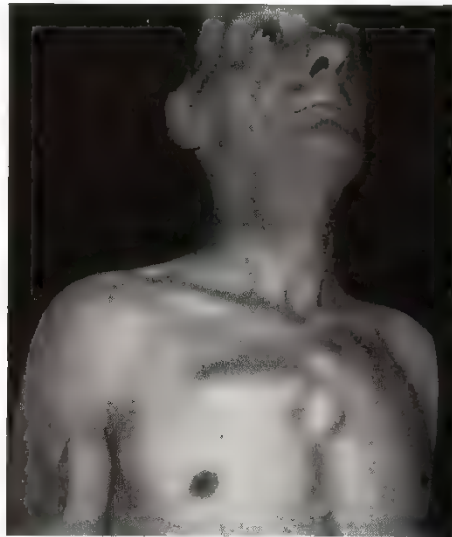
**Reticulosis of an Internal Mammary Lymph-node.**—As it enlarges it causes a solid swelling in one of the upper intercostal spaces near the sternum (*Fig. 381*); the costal cartilage is sometimes involved in the swelling. This may be the presenting lesion of these conditions.

### CYSTIC SWELLINGS OF THE THORACIC WALL

A patient with a cystic swelling connected with the deeper layers of the thoracic wall is presented. After confirming that the swelling fluctuates, apply the following tests: ask the patient to cough, and by inspection and palpation note if there is any impulse.



*Fig. 381.*—Firm swelling centred over the 4th intercostal space. This was the presenting sign in this case of Hodgkin's disease. Note that the patient looks ill.



*Fig. 382.*—Tuberculous abscess connected with the third right costal cartilage.



*Fig. 383.*—Tuberculous abscess originating in an internal mammary lymph-node in an Indian. The abscess is about to burst through the skin (*see p. 143*).



*Fig. 384.*—A retromammary tuberculoma connected with a tuberculous internal mammary lymph-node. Mistaken by several observers for a breast lump.

**Cold Abscess arising in the Thoracic Wall.**—*When the swelling is situated anteriorly* and there is no evidence of gross underlying pleural effusion (see Empyema Necessitatis, p. 193) there are two possibilities: (a) that the abscess has originated in a tuberculous rib or costal cartilage, in which case it is likely that a portion of the rib that is diseased will be found to be expanded. In Fig. 382 the enlarged 3rd rib can be seen, as also (overlying the sternum) the swelling caused by the abscess. Should, however, the related ribs and costal cartilages look and feel normal, it is probable that: (b) the site of origin of the abscess is a tuberculous internal mammary lymph-node (Fig. 383). Sometimes the related costochondral junctions can only be palpated adequately after the abscess has been aspirated. The internal mammary chain of lymph-nodes does not extend below the 6th intercostal space; a cold abscess below this level is almost certainly not of lymph-node origin.

A cold abscess of the lateral thoracic wall is uncommon.

*When the swelling is situated posteriorly* there are three possible sites of origin: (1) a tuberculous rib; (2) a tuberculous dorsal vertebra; (3) a perinephric abscess, often secondary to a tuberculous pyonephrosis. The latter two conditions are confirmed or eliminated by examining the spine in the case of (2), and in the case of (3) by excretory pyelography.

Occasionally a cold abscess of the thoracic wall is partly reducible into an extrapleural pocket of the abscess cavity.

**Retromammary Abscess.**—The *acute type* results from suppuration in deep lobules of the breast, and pus burrowing posteriorly comes to lie between the breast in front and the pectoral fascia behind, viz. —————→

In the *chronic variety* the pus occupies the same plane, but it arises in a tuberculous costochondral junction or in a tuberculous lymph-node of the internal mammary chain (Fig. 384). Retromammary pus tends to gravitate beneath the lower and outer quadrant of the breast, and it displaces the breast forward, thereby creating an illusion that the breast is enlarged.

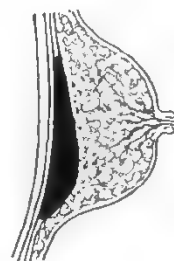


Fig. 385.—Empyema necessitatis in an African.



Fig. 386.—Aortic aneurysm eroding the thoracic wall. The patient had little complaint. His Wassermann reaction was strongly positive



**Empyema Necessitatis.**—Although not now often seen in Western Europe and North America, empyema necessitatis (*Fig. 385*) is still encountered fairly frequently in some parts of the world. Almost always the swelling appears on the anterior or lateral aspects of the thorax, somewhere between the 3rd and 6th intercostal spaces. Fluctuation is obtained readily. If the flat of the hand is laid over the swelling and the patient is asked to cough, usually a fluid thrill can be felt. With the flat of the hand still in position, exert moderate pressure on the swelling. Contrary to what might be thought, it is exceptional for an empyema necessitatis to be completely reducible into the thoracic cavity, probably because today most empyemata necessitatis occurring in urban communities are the result of seepage along the needle track of a previous aspiration (Andreasen). When it occurs on the left side, sometimes the purulent collection transmits the cardiac pulsation and has been mistaken for an aneurysm.

**Aortic Aneurysm.**—It is possible for a syphilitic aortic aneurysm to give rise to a swelling near the sternum (*Fig. 386*), but it is unlikely that such a pulsating swelling will cause diagnostic perplexity.

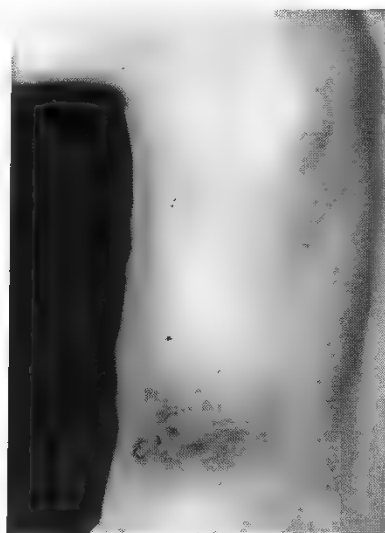
**A Hernia of the Lung** is a great rarity: it gives rise to a tympanitic cystic swelling, usually at the apex of the lung, that is completely reducible.

### DISCHARGING SINUSES OF THE THORACIC WALL

**Chronic Empyema Sinus.**—An empyema has been drained, but the sinus continues to discharge indefinitely (*Fig. 387*). Among the common causes are ineffectual drainage, a retained drainage-tube, necrosis of ribs, thickening of the pleura with fibrosis of the lung, tuberculosis, and actinomycosis. The elucidation



*Fig. 387.*—Chronic empyema sinus of seven years' duration. The opening is at a comparatively high level. The patient had clubbing of the fingers.



*Fig. 388.*—Actinomycotic sinus arising from the lung.

of the problem is impossible without the aid of radiography and other diagnostic adjuvants. Nevertheless, at the clinical examination we note the level of the sinus, palpate the bony thorax around it for undue callus formation, and examine the pus.

**Actinomycotic Sinus.**—The surrounding skin is apt to present a dusky appearance (*Fig. 388*) because of involvement, not of the skin, but of the underlying subcutaneous tissues. Perhaps the most notable feature of this lesion is the curious linear puckering that appears in the area about the sinus or sinuses. Neither percussion nor auscultation, nor for that matter radiography, gives any clue to the correct diagnosis, which is made in the manner described on p. 40. In more than half the cases the pulmonary infection is secondary to actinomycosis elsewhere.

**Sinus resulting from a Tuberculous Rib or a Tuberculous Internal Mammary Lymph-node.**—The characters of the preceding abscess have been considered on p. 192.

### RETROCLAVICULAR SWELLINGS

Reference is made here to swellings situated in the supraclavicular fossa that plunge beneath the clavicle to fill the infraclavicular fossa rather than to enlarged lymph-nodes in this situation.

Retroclavicular swellings often present difficulties in diagnosis. A tumour of one of the cords of the brachial plexus is liable to be mistaken for a deep-seated lipoma or an enlarged lymph-node. Indiscriminate excision is disastrous for the function of the arm.

A stony-hard mass in this deep recess beneath the clavicle may prove to be not a mass of malignant lymph-nodes but a bone tumour arising from the first rib. An X-ray is necessary for accurate diagnosis.

### CARCINOMA OF THE BRONCHUS

Carcinoma of the bronchus has increased in frequency so alarmingly that it is incumbent upon the clinician to be highly alert concerning the possibility of this disease, particularly in those with a long history of heavy smoking. Tobacco staining or clubbing of the fingers (*see* p. 184) are data which should arouse suspicion.

Early diagnosis in a curable stage is a matter for the chest physician who usually invokes the aid of a surgeon skilled in the use of the bronchoscope. Unfortunately, carcinoma of the bronchus is often highly malignant and metastasizes early, the patient presenting with a metastasis. It used to be said that syphilis was the great imitator (of other diseases), but with the decline in untreated venereal disease, carcinoma of the bronchus has taken over this unenviable role.

The following are the more frequent manifestations as seen by the surgeon:—

*Bone metastases*, in the ribs (*see* p. 190), long bones (*see* p. 435), or back (*see* p. 219). Pain is the leading feature in the great majority of patients, with a swelling appearing as a late sign.

*Pathological fractures* are not infrequent, particularly in the long bones (*see* p. 443).

*Loss of appetite and weight* should, in the first instance, suggest cancer of the stomach. In many cases, carcinoma of a bronchus is found to be the culprit.

*Enlarged lymph-nodes* in the neck (*see* p. 141) or axillae (*see* p. 177) of male patients are frequent. Typically they are stony-hard in consistency. It is not unknown for enlargement of other nodes (e.g., groin, *see* p. 258) to be the first sign of bronchial carcinoma.

*Recurrent laryngeal nerve paralysis* (hoarseness) in the absence of thyroid cancer (*see* p. 158) often proves to be due to carcinomatous deposits originating in a bronchus.

*Malignant enlargement of the liver* (*see* p. 241) or *ascites* (*see* p. 250) are occasional presentations.

*Secondary nodules of growth in the skin*, single, or few in number, or multiple, are sometimes the first sign. They are of hard consistency, vary in size from a

couple of centimetres in diameter down to minute swellings which can only be discerned by running the pulp of the index finger over them, and have appeared in a matter of days or weeks (cf. multiple lipomata, *see Fig. 46, p. 24*).

*Superior vena caval obstruction (see below).*

*Pancoast's Syndrome* is the result of the carcinoma commencing in the apex of the lung, and, as a carcinoma in this area is silent for a long period, it is the harbinger of death. It comprises three or more of the following manifestations: distension of the veins of the neck (pressure on the superior vena cava); swelling of the face from the same cause; Horner's syndrome (*see p. 413*) from pressure on the sympathetic chain; shooting pains down the arm. Later a lower brachial plexus lesion develops (*see p. 414*).

### PRESSURE ON THE SUPERIOR VENA CAVA

Visible engorgement of the veins of the neck is usually an indication of metastases in the posterior mediastinum pressing upon the superior vena cava, but it can be due to other causes such as a primary neoplasm, or a cyst pressing upon this great venous channel, or cicatricial contracture following a stab wound (*Fig. 389*).



*Fig. 389.*—Dilated cervical and chest-wall veins due to obstruction of the superior vena cava.

### EXAMINATION OF A PATIENT WITH SUSPECTED ACUTE PULMONARY INFECTION

When called to a patient whose history suggests postoperative atelectasis, pulmonary infection, or a subdiaphragmatic abscess, as well as when confronted with a patient whose sudden upper abdominal pain might be pleuritic in origin, adopt the following routine:—

1. Look for evidence of cyanosis (*see p. 47*).
2. While counting the patient's pulse-rate and taking the temperature (if this has not been recorded within the past half-hour) focus your attention on the respiratory movements. Are the respirations laboured? Do they appear painful?

Then proceed to count the respirations. For those whose memory for figures is not a strong point the following table is of value:—

1st year	..	35–45 per minute
1–2 years	..	20–45
3–4 years	..	20–40
4–5 years	..	20–30
Adults	..	16–20

3. Bare the chest, and observe the respiratory excursions, noting particularly if both sides of the lower chest expand equally. Then ask the patient to breathe deeply and continue the observation, directing the eyes first to the movements of the clavicles (apices), then to the movements of the upper abdomen (bases), and lastly to the more obvious lateral movement of the costal margins. Does one side expand less well than the other? To assess this point, move to the foot of the bed for a few moments.

4. Place the hands over the costal margins, as shown in *Fig. 390*. The fact that one side expands less well than the other becomes evident even in a case where doubt existed, or when no inequality was observed on inspection.



*Fig. 390.*—Ascertaining respiratory excursions. Commence during expiration with the thumbs opposed: normally inspiratory widening of the subcostal angle occurs equally on both sides.

5. Further examination by percussion, palpation, auscultation, and X-ray is beyond our briefing.

**CLINICAL DIAGNOSIS OF POSTOPERATIVE CHEST COMPLICATIONS**

Although facilities for early X-ray of patients developing chest complications are now fairly universally available, the practising surgeon will find it an advantage to be able to make a tentative diagnosis early, and thereby institute immediate treatment.



In order of probable times of onset after the operation the following are the conditions commonly encountered:—

**1. Venous Air Embolism** is not the almost unheard-of rarity that it is alleged to be in some quarters. It is considered first as it can occur at any time after the commencement of an operation or diagnostic procedure. In fatal cases in which the diagnosis is unsuspected, death is often attributed to pulmonary embolism or coronary thrombosis. Even at necropsy, air embolism is often missed because of slovenly technique (Simpson). Air can be sucked into the venous system during operation or in procedures such as open heart operations, arteriography, or blood transfusion, but the most common cause is permitting the bottle of an intravenous infusion set to run dry.

The onset is usually abrupt, with deep inspirations, coughing expirations, cyanosis, then a few gasping breaths succeeded by unconsciousness and cessation of respiration. The pulse becomes imperceptible and the blood-pressure falls to an unrecordable level. A stethoscope applied to the precordium reveals the 'mill-wheel' murmur—a churning and splashing that masks the true heart-sounds. In not a few instances, if the pulps of the fingers are placed over the jugular vein,



Fig. 391.—The three types of atelectasis. Note the site of the plug of mucus (black) in the second and third varieties.

bubbles of air can be felt moving beneath. In about half the cases, especially those in which the head was higher than the trunk at the time of the entry of air, the state of unconsciousness is preceded by tonic convulsion followed by muscular twitchings.

**2. Inhaled Vomitus—Aspiration Pneumonia.**—In spite of the universal adoption of methods to prevent this catastrophe, from time to time these prophylactic measures evade effective application, and the unconscious or semiconscious patient vomits, and inhales the vomitus. Probably the highest incidence of this regrettable occurrence is in connexion with head injuries, but the recovery period following general anaesthesia—particularly short anaesthetics in poorly prepared patients—accounts for many cases. On the other hand, owing to the great attention that is paid to gastric aspiration in cases of intestinal obstruction, once the patient has left the operating table this complication is infrequent. Occasionally vomitus is inhaled by a fully conscious person, more especially by young children in the early stages of a severe systemic infection.

Called to a dyspnoeic patient recovering from a general anaesthetic, the smell of vomitus and, perhaps, the presence of some of it on the pillow may direct the clinician's thoughts to this little-discussed subject. In the absence of a more obvious cause for the dyspnoea and cyanosis (e.g., a cervical haematoma following thyroidectomy) the first thing to do is to prise open the mouth, draw forward the tongue, and insert a finger far back into the laryngopharynx. There have been occasions where the outcome of this presence of mind has resulted in the hooking out of a piece of food, or even a denture. If the insertion of an airway does not improve matters immediately, it must be assumed that vomitus is filling the trachea and bronchi, and unless it is removed mechanically by all means available, in a very short period of time the patient will succumb.

**3. Collapse of the Lung (Atelectasis).**—This is by far the most frequent postoperative pulmonary complication. There are three varieties (Fig. 391); each is essentially the result of blockage of some part of the bronchial tree with a plug, or plugs, of inspissated mucus. If permitted to persist,



infection of the uninflated portion of the lungs soon follows. In about 80 per cent of cases atelectasis is right-sided and nearly always occurs during the first 24–48 hours after operation.

*Lobular Atelectasis* is usually basal. In the early stages there are little or no constitutional disturbances. Pyrexia and cough do not appear until infection supervenes. The most valuable early sign is the presence of sonorous rhonchi over the base, or more usually throughout the lung field on the affected side (Palmer). If early and effective treatment is not instituted the condition is liable to be followed by bronchopneumonia and, indeed, most instances of 'postoperative pneumonia' are of this variety.

*Lobar Collapse*.—There is a moderate elevation of temperature, followed by a sudden rise to 39° C. or more. The other leading feature is dyspnoea. Pain in the chest is comparatively rare. On examining the bared chest, respiratory movement is likely to be less active on the side (see Fig. 390).

*Massive Collapse* is comparatively rare. In addition to a plug of mucus, it can arise as a result of inhaling a foreign body. Unlike the foregoing, it is more frequent on the left side, due to the conformation of the left bronchus. Cyanosis of the nail-beds will almost certainly be present. In typical cases there is very restricted movement or immobility of the thorax on the involved side.

The following signs should be sought early:

*a. The Trachea is displaced to the Side of the Lesion*.—If the index finger is placed in the suprasternal notch (Fig. 392) and the head is flexed, deviation of the trachea can be detected readily (Sellors).

*b. The Heart is displaced towards the Side of the Lesion (Apex Beat)*.

*c. The Sternomastoid Sign* may be present on the side of the lesion: the sternal head of this muscle is more tense than its fellow as it is an accessory muscle of respiration.

**4. Pulmonary Embolism**.—The patient is commonly old, or otherwise unfit, although the condition can occur, tragically, in the young and fit patient and, rarely, in children. In surgical wards usually he or she underwent an operation seven to ten days previously, and up to the time of the catastrophe was progressing favourably. On the medical side cardiac disease is the most significant factor associated with the combination of phlebothrombosis decubiti and pulmonary embolism. As a rule pulmonary embolism is unheralded by signs of peripheral venous thrombosis (see p. 398).

According to its size, lodgement of an embolus in the pulmonary arterial tree brings about a varying train of events:—

*a. Arrest at the Bifurcation of the Pulmonary Arterial Trunk*.—Suddenly the patient cries out. There is a feeling of

impending death from suffocation and usually a great desire to defaecate. Profound shock causes the patient to become pale and to sweat profusely. The blood-pressure falls; the pulse becomes feeble and irregular, or imperceptible. If, as is usual, the right heart fails, pallor gives place to cyanosis and death occurs in a few minutes.

*b. Arrest in the Right or Left Pulmonary Artery* is characterized by a similar onset, but the patient rallies, and if he survives for an hour or more the blood-pressure remains low. Sweating, pallor, tachycardia, increased respiratory rate,\* and moderate pyrexia are leading signs. With treatment, some of this category of patient can be saved, so it is important to know that the diagnosis is one of exclusion; the electrocardiogram does *not* show changes of coronary thrombosis; the chest X-ray is *normal*. In doubtful cases, if facilities are available the diagnosis can be confirmed by scanning the lungs after the intravenous administration of human albumin labelled with radioactive iodine or by pulmonary arteriography.

*c. Arrest in a Large Branch of the Pulmonary Arteries*.—The onset is quite dissimilar to either of the above. The patient experiences a sudden pain in the chest, because a segment of the lung has become infarcted. The severe generalized thoracic pain to a large extent passes off, but more localized pain on taking a deep breath, or on coughing, takes its place. The respiratory rate and



Fig. 392.—Palpating the suprasternal notch for tracheal deviation.

\* The patient, dyspnoeic due to pulmonary embolism, prefers to lie flat (Gibson).

temperature are raised. At every visit (and the patient should be visited frequently) the sputum pot should be inspected; in about 40 per cent of cases the patient coughs up blood or clot, the latter being particularly characteristic.

*d. A Shower of Small Pulmonary Emboli* gives rise to symptoms and signs identical with bronchopneumonia. This type of case usually shows the signs of phlebothrombosis decubiti.

### THE OESOPHAGUS

So far as direct physical examination is concerned, no organ in the body is more inaccessible than the oesophagus. Nevertheless, by the application of indirect physical signs, much can be ascertained—so much so that in some instances a reasoned diagnosis can be made by their aid alone. This must usually be confirmed by radiology and oesophagoscopy.

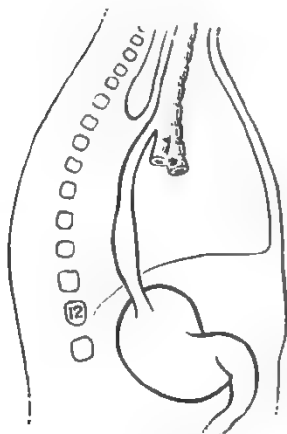


Fig. 393.—Congenital atresia of the oesophagus—usual configuration.



Fig. 394.—Frothy saliva pours almost continuously from the nose and mouth. This is pathognomonic of congenital atresia of the oesophagus.

### CONGENITAL ATRESIA OF THE OESOPHAGUS

It is computed that congenital atresia of the oesophagus occurs once in every 800 births. In 85 per cent of cases the configuration of the deformity is that shown in Fig. 393. It will be seen that the upper pouch ends blindly, while the lower pouch communicates with the trachea. Recognition within 48 hours of birth and subsequent surgical rectification is the only hope of the infant's survival. The diagnosis is not difficult. The newborn babe regurgitates all its first and every feed. If this happens and *food* spills into the lungs, pneumonia follows. Therefore every neonate should have sterile water for the first feed, so that if atresia of the oesophagus is present the infant will not have to undergo the necessary operation with the added complication of pneumonia. In addition to immediate regurgitation of the first feed, the infant appears to salivate profusely. Actually there is no increase in production, but as none can be swallowed, saliva pours from the mouth and the nose almost continuously, and because it is mixed with air bubbles it assumes a frothy character (Fig. 394). This copious outpouring of frothy saliva is *the* sign of oesophageal atresia: to no other condition does this phenomenon appertain. When a

tracheo-oesophageal fistula is fully patent, in addition to the above signs the infant's abdomen becomes distended because an excessive amount of air is swallowed, and if regurgitation of stomach contents occurs, the foam may become bile-stained. The diagnosis can be confirmed in the following simple manner: a soft rubber catheter is introduced into the oesophagus through the nose, and if an obstruction is encountered 10 cm. from the nostril, the diagnosis is practically certain. In this event, all attempts at feeding must be stopped forthwith.

**The Syndrome of Cyanosis on Feeding a Newborn Infant.—**

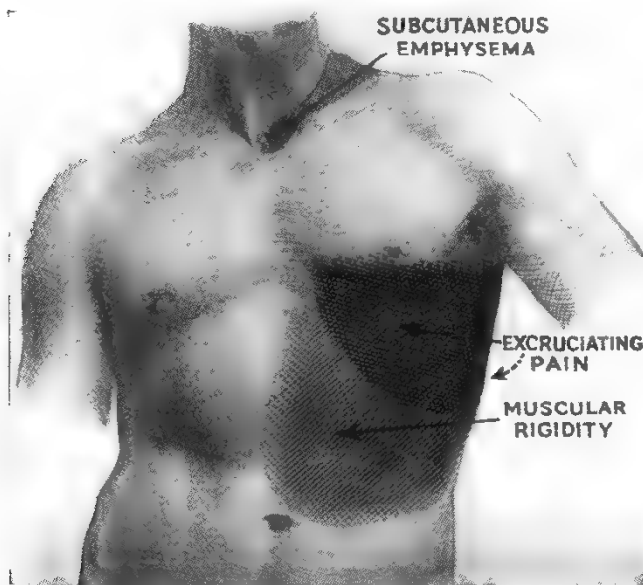
1. A large diaphragmatic hernia permitting abdominal contents in the left pleural cavity may cause bile-stained vomitus (sometimes with blood) accompanying respiratory embarrassment on feeding, but no frothing. Bowel-sounds are heard on auscultation of the left half of the chest, and with a large hernia breath-sounds are absent. The abdomen may appear flatter than usual (scaphoid) as much of its contents —————→ are in the chest. An X-ray is necessary to confirm the diagnosis. Urgent surgical treatment is, on occasion, necessary.



2. Oesophageal Atresia (*see above*).
3. Dysphagia Lusoria (*see p. 203*).
4. Micrognathia (*see p. 88*).
5. Choanal Atresia (*see p. 88*).

**SPONTANEOUS RUPTURE OF THE OESOPHAGUS**

If the diagnosis can be made early and the patient subjected to immediate operation, death, otherwise inevitable, can sometimes be avoided. Eighty-five per cent of the patients are males, and



*Fig. 395.*—Leading symptoms and signs of spontaneous juxtadiaphragmatic rupture of the oesophagus.

a high proportion have a history of alcoholism. Following a heavy meal there is vomiting, and during one of these expulsive acts the oesophagus ruptures in its lower third. Agonizing pain is experienced usually in the left (occasionally the right) side of the lower thorax, radiating to the back. Note particularly that, unlike many conditions from which rupture of the oesophagus must be differentiated, vomiting *precedes* the pain. As a rule vomiting ceases with the onset of the rupture, but should it continue, the vomitus is likely to be streaked with bright red blood. There is insatiable thirst, and the pain is so intense that morphine fails to relieve it. In many instances subcutaneous emphysema appears in the suprasternal notch (*Fig. 395*) and spreads around the neck; when sought, crepitus often can be detected here within an hour of the rupture.

In really early cases examination of the thorax reveals no physical signs, for the gas and fluid are confined to the mediastinum. When, after a matter of a few hours, the extravasated gas and fluid burst through the parietal pleura a hydropneumothorax results, and the general course is swiftly downhill, with dyspnoea, cyanosis, and rapidly increasing circulatory failure.

### REFLUX OESOPHAGITIS

Reflux oesophagitis, the most common affection of the oesophagus, can occur apart from a hiatus hernia, but in about 80 per cent of cases it is associated with this (see p. 272). The typical sufferer is short, with a tendency to obesity, and as a rule gives a long history of episodic attacks and reports only when the symptoms have become severe and more or less continuous.

*Pain* is a leading symptom. Pain in the back, between the shoulders, in the presence of a known hiatus hernia denotes oesophagitis; such pain seldom bears a definite relationship to meals, although it is sometimes provoked by taking hot fluids, hot food, or alcohol. The pain is wont to wake the patient during the night; often it is relieved by sitting upright, and sometimes by taking alkalis.

*Heartburn* with regurgitation of small quantities of acid material is very common, especially when lying flat or stooping.

*Absence of Tenderness.*—The complete absence of tenderness in the epigastrium or in either hypochondrium is helpful in differentiating the condition from an upper abdominal lesion.

*Dysphagia* is rather a frequent symptom of oesophagitis. The patient says that the food becomes arrested for some moments at the level of the lowest part of the breast bone. This occurs long before any cicatricial stenosis has developed, and at this time it is due, in all probability, to oedema of the mucous membrane. Later, as stenosis due to fibrosis ensues, it becomes progressively worse.

### INCREASING DYSPHAGIA AS A SOLE SYMPTOM

Undoubtedly the diagnosis can be ascertained only by radiological examination and by oesophagoscopy. Nevertheless there are certain points to which attention must be directed at the preliminary clinical examination.

Ask the patient where he thinks the food is arrested. If he is intelligent, he can often indicate the point at which he thinks 'the stoppage' is occurring, this usually being the site of the lesion. Examine the mouth. Palpate the neck, particularly for enlarged lymph-nodes, paying especial attention to the supraclavicular fossae (see p. 140). Examine the abdomen (enlarged liver), and at the same time look for signs of wasting as evinced by laxity of the subcutaneous tissues.

**Carcinoma of the Oesophagus.** This is the commonest cause of increasing dysphagia, being particularly common in Japan and tropical Africa. Men over 45 years of age are the most frequent victims, but 30 per cent are women. In advanced cases regurgitation (oesophageal pseudo-vomiting) is a fairly common symptom. The regurgitated material is alkaline, mixed with saliva, and possibly streaked with blood.

Prominent among the non-malignant causes of increasing dysphagia are the following:—

**Achalasia of the Oesophagus (Mega-oesophagus)\*** occurs principally in women over 40 years of age, but it is not limited to that sex or to that time of life. More often than not the patient only seeks relief after the symptoms have been present for many years. The long history is helpful in differentiating the condition from carcinoma, as also is the unique feature that dysphagia is more in evidence when swallowing fluids as opposed to solids. As a result of probably years of under-nourishment, the patient is sometimes reduced to a state of chronic ill health, rendering normal activities impossible.



Fig. 396.—Patient exhibiting the signs of sideropaenic dysphagia. She was able to swallow fluids only.

**Sideropaenic Dysphagia.†** — The patient is nearly always a middle-aged woman. Typically she complains of choking, or fear of choking, and delayed swallowing of food localized at the level of the cricoid cartilage. Close examination provides clues to the diagnosis, but not all the following are necessarily present (Fig. 396).

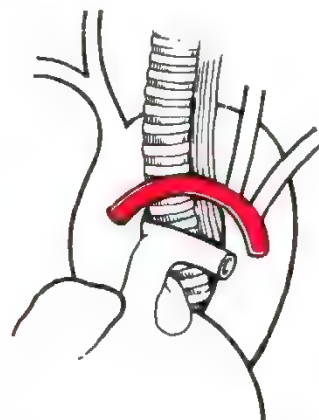


Fig. 397.—The usual anatomical configuration of a vascular ring.

*Moderate Pallor.*

*The Lips and Corners of the Mouth* are cracked, giving the mouth a pursed appearance. This angular stomatitis or cheilosis (see p. 110) is often accompanied by increased salivation.

*The Tongue* is usually devoid of papillae, smooth, and pale, but rarely inflamed.

*The Finger-nails* are brittle, and tend to be spoon-shaped (koilonychia‡).

*The Spleen* is only occasionally enlarged, as in other iron-deficiency anaemias.

Koilonychia, an inflamed tongue, and cheilosis are not unusual in sideropaenia§ *per se*, and thus the syndrome can only be set apart by the presence of the characteristic dysphagia. Instrumental examination of the laryngopharynx and the oesophagus is necessary as the condition is pre-malignant and post-cricoid carcinoma may have supervened.

\* The widely employed term 'cardiospasm' is inaccurate, for the spasm lies just above the cardia. The condition is common in South and Central America where it occurs as a complication of Chagas' disease of which, it has been estimated by the World Health Organization, there are 7 million cases in this part of the world.

† This syndrome was first described in 1909 by Paterson and Kelly. It is also known (correctly but clumsily) as the Paterson-Kelly-Plummer-Vinson syndrome and (incorrectly but commonly) as the Plummer-Vinson syndrome.

‡ *Koilonychia*. Greek, κοῖλος = hollow + ὄνυξ = a nail.

§ *Sideropaenia*. Greek, σίδηρος = iron + πένηξ = poverty.



**Globus Hystericus** is quite common. Again, the patient is almost invariably female and complains that food seems to stick at the level of the cricoid cartilage. However, she is not anaemic and clinical examination of the neck together with instrumental examination of the laryngopharynx and X-ray investigation by means of a barium swallow reveal no abnormality. The stigmata of neurosis (*see p. 50*) may be present.

**Pharyngeal Pouch** (*see p. 146*) is also sometimes a cause of dysphagia.

**Dysphagia Lusoria\*** (Vascular Ring).—The oesophagus and trachea are surrounded by an arterial ring (*Fig. 397*) due to failure in the normal disappearance of parts of the primitive aortic arches. Usually the ring does not obstruct the tubes passing through it at birth, but as these grow relatively more rapidly than the arteries, dysphagia and stridor may appear in a matter of months or years. A baby thus affected will lie with its neck extended as in this position the pressure on the trachea is reduced. Flexion of the neck brings on the stridor.

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\* *Lusoria*. Latin, *lusus* = a jest. Originally described as a jest of nature.

## CHAPTER XVII

## THE BACK

## SPINA BIFIDA

FAILURE of the fusion of the cartilaginous bars forming the vertebral arch results in a defect of the spinolaminar component of the vertebral column. Usually it affects one vertebra only, most commonly in the lumbosacral region; less often, a meningocele occurs in the cervico-occipital region (*see* p. 55).

**Spina Bifida Cystica** presents in four forms:—

*Myelocele* is the outcome of failure of the neural as well as the vertebral arch to close. This produces an oval, raw, uncovered defect communicating with the central canal of the spinal cord. This variety is fairly common, but the infant is stillborn, or dies shortly after birth.

*Syringomyelocele* is comparatively rare. Through the bony defect bulges a cystic swelling formed, not of the membranes of the cord only, but by gross dilatation of the central canal of the spinal cord (hydromyelia). Such a state of affairs is associated with gross paralyses below the lesion. Little wonder, then, that clinical interest is mainly centred around the other varieties of spina bifida, which are:—

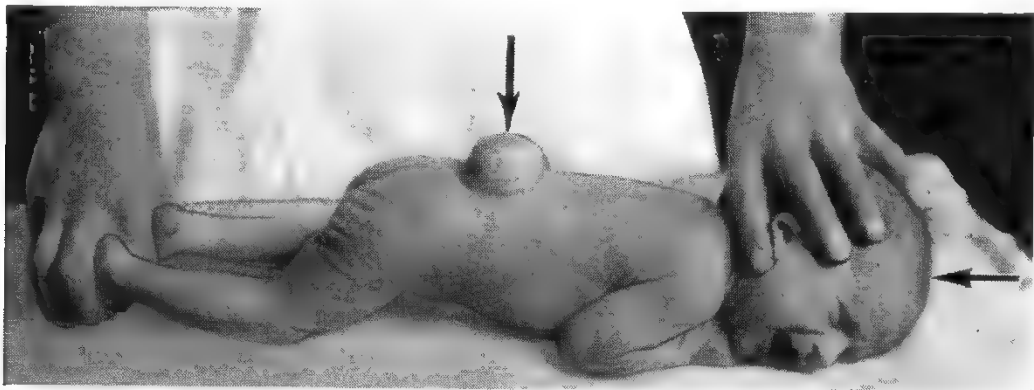


Fig. 398.—A transmitted impulse could be obtained from the anterior fontanelle to the cystic swelling in this case of meningocele.

*Meningocele*.—There is a protrusion of meninges through a defect in the spinolaminar segment. The sac contains cerebrospinal fluid only. In very early life the most reliable sign that a spina bifida cystica is a meningocele is that the swelling is entirely covered by healthy skin (*Fig. 398*). This variety is relatively favourable but unfortunately comprises only 5 per cent of cases presenting for surgery.

*Meningomyelocele*.—In England and Wales 2500 babies are born alive with this each year, a formidable problem as surgical treatment is now feasible. The normally developed spinal cord or cauda equina lies within the sac, sometimes adherent to the serous lining of the protruding swelling. The sac is not entirely covered by skin, but is surmounted by unepithelialized meninges (*Fig. 399*). Not unexpectedly, in a matter of days or weeks, if untreated, the sac ruptures, the underlying spinal cord looking like granulation tissue.

*Further Clinical Examination*.—When a spina bifida cystica is intact, transmitted impulse can be sought from the swelling to the anterior fontanelle (*see*

*Fig. 398*): if present it signifies that a wide-mouthed channel communicates between the cerebrospinal canal and the spina bifida cystica. This does not constitute fluctuation (*see p. 11*). The swelling is brilliantly translucent and, in cases of meningocele, occasionally the cord or nerves can be seen as dark shadows



*Fig. 399.*—Meningocele in a neonate. Note that hydrocephalus is also present.

within the sac. If it was not obvious on the first sight of the patient, one should now measure the head to exclude hydrocephalus (*see p. 55*). Hydrocephalus, which develops in some two-thirds of otherwise successfully treated cases of spina bifida cystica, is never a result of the operation (as was thought formerly) but is a manifestation of the Arnold-Chiari malformation (displacement of the hindbrain



*Fig. 400.*—Congenital sacrococcygeal sinus.

(rhombencephalon) and herniation into the spinal canal of the cerebellar tonsils, which obstruct the free circulation of cerebrospinal fluid).

Lastly, one should seek signs of paralysis of the lower extremities and note whether the anus is patulous.

**Spina Bifida Occulta** is due to failure of the vertebral arches to unite, but there is no protrusion of the coverings of the spinal cord. Most instances are detected radiologically in investigating patients with low back pain but a local patch of hair, a naevolipoma, or a dimple sometimes marks the site of the defect—in no

other situation does Nature call attention to a deep-seated abnormality in such a brazen way. The dimple (post-anal dimple) is caused by a fibrous band—the *membrana reunions*—which unites the deep layers of the skin to the spinal theca. The *membrana reunions* neither stretches nor does it grow, but remains stationary in length while the body increases in stature. The skin is pulled upon at one end and the theca and the spinal nerve-roots at the other, possibly producing such conditions as foot-drop and weakness of urinary and anal sphincters *appearing for the first time in childhood or adolescence*. When a dimpling occurs very early in foetal life it progresses apace, and at birth a pit of varying depth results. This is known as:—

**Congenital Sacrococcygeal Sinus (Fig. 400).**—Should the sinus expand intraspinally, to form a dermoid cyst, the symptoms and signs are often primarily those of a cauda equina tumour. A sacrococcygeal sinus, which is rare, is sometimes mistaken for a pilonidal sinus (*see* p. 282), which is common but is never found at birth.



Fig. 401.—The dimples of Venus mark the sites of the sacro-iliac joints.

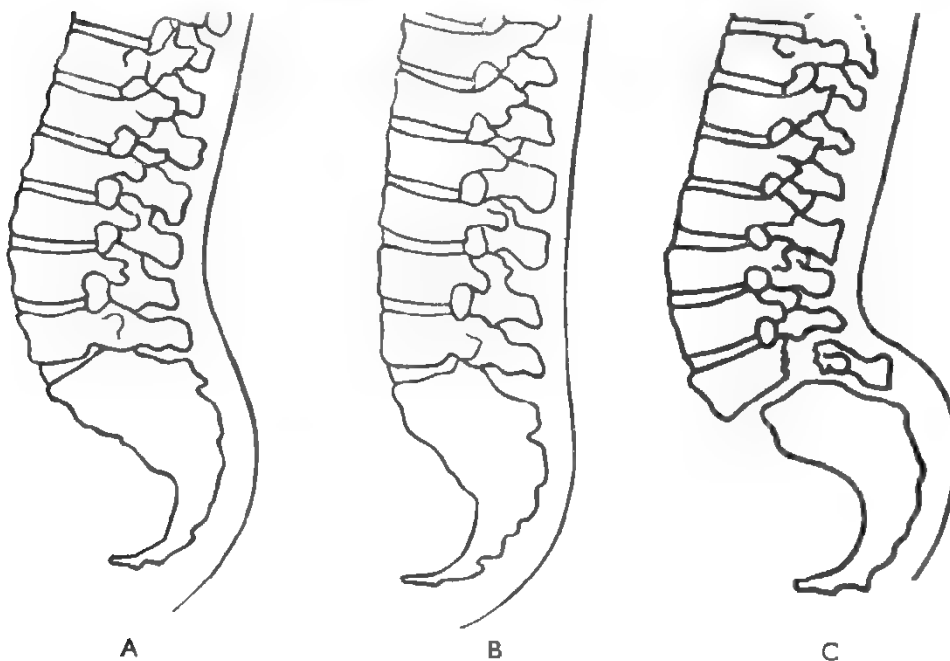


Fig. 402.—Illustrating the lateral contour of the back. A, Normal; B, In conditions associated with sacrospinalis spasm; C, Spondylolisthesis.

### EXAMINATION OF THE BACK

This is best carried out first with the patient standing and then lying down (*see* p. 211).

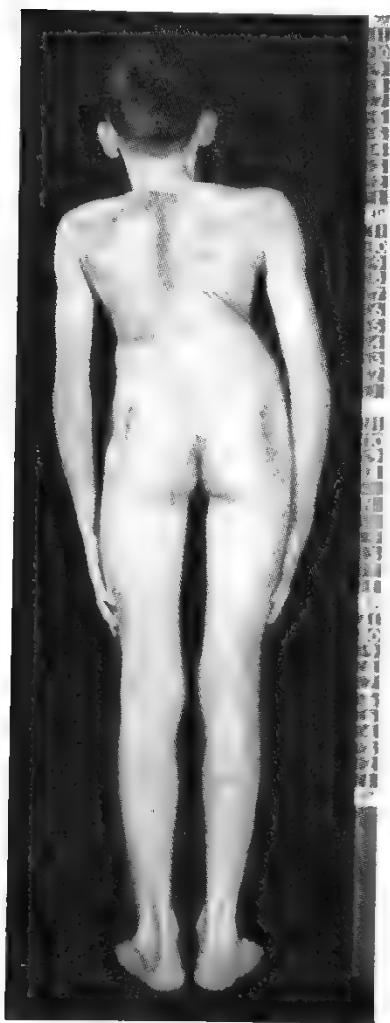
### A. EXAMINATION STANDING.—

**Inspection.**—Proper inspection requires exposure of the entire posterior aspect of the patient from head to foot, and removal of the shoes to avoid the effect of high or unequal heels. The arms hang loosely by the side.

**Landmarks** are noted—the vertebra prominens, the spinous processes, the angles of the scapulae, the posterior iliac spines and crests. In many women the dimples of Venus are visible (*Fig. 401*): they overlie the sacro-iliac joints.

The lateral contour of the back is inspected. Normally there is a lumbar lordosis (*Fig. 402 A*), more marked in the female. In many conditions characterized by spasm of the sacrospinalis muscle this is lost (*Fig. 402 B*) notably prolapsed lumbar intervertebral disk and early Pott's disease. Increased lordosis (*Fig. 402 C*) denotes spondylolisthesis (*see p. 220*).

Observe the symmetry of the body—whether one half is more prominent than the other. This can be done by comparing the two sides of the trunk with reference to an imaginary line prolonged upwards from the gluteal cleft. In this way scoliosis is detected. Now direct the patient to lean forward and cross the



*Fig. 403.*—Advanced idiopathic kyphoscoliosis in a boy aged 14.



*Fig. 404.*—Idiopathic infantile scoliosis. Note the skin wrinkles on the concave side.

arms over the chest so that the hands rest on opposite shoulders. It is remarkable how much greater any fixed deformity appears in this position whereas a postural deformity disappears (*Chaklin*).

Sometimes the spinous processes of the vertebrae are not very prominent, and it may be difficult to detect scoliosis; ask the patient to fold his arms and lean forward,



and then run the finger firmly down the vertebrae without hurting him. A red line on the skin results, and the curve of the spine becomes evident.

**Scoliosis.**\*—Note whether the curve is single (*see Fig. 412*), S-shaped (*Fig. 403*), or more complex. Record the findings diagrammatically. Endeavour to determine which type of scoliosis is present. The various types of scoliosis are:—

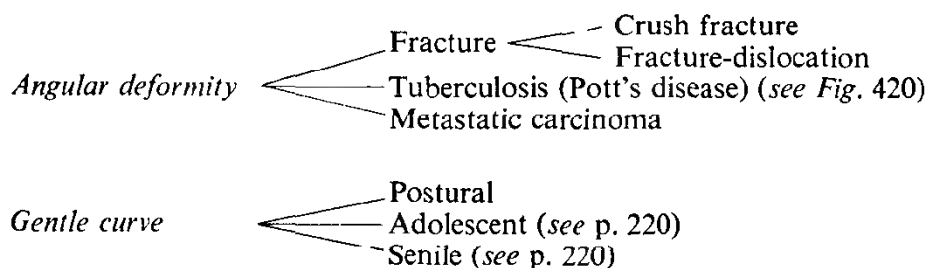
**POSTURAL.**—Usually the curve is single—it disappears when the patient bends forward.

*Postural Scoliosis in Infancy.*—Browne believed that so-called ‘idiopathic kyphoscoliosis’ (*see below*) commences in infancy with a single curve which, if untreated, will, in a proportion of cases, progress to the more serious condition. Admittedly there is controversy as to the proportion of infants in which the condition is progressive; probably it is small. Suffice it to state here that the clinician should be on the look-out, especially if the mother states that ‘the baby always screws round one way’. If the baby is suffering from congenital postural scoliosis it will not spontaneously bend away from the side of the concavity (*Fig. 404*) when lying on its abdomen. Skin wrinkles on the trunk on this side are also typical.

**COMPENSATORY** scoliosis is due to a cause that is usually obvious: (a) Torticollis; (b) pneumonectomy or thoracoplasty; (c) short leg; or (d) deformed hip. That due to a short leg usually disappears when the patient sits, but comparative measurements of the length of the lower limbs are required.

**STRUCTURAL** scoliosis is always accompanied by rotation of vertebrae, i.e., there is an element of kyphosis (*see below*) as well. The main causes are congenital (e.g., hemivertebra), paralysis of the muscles of the back (especially that following poliomyelitis), and the most common variety, idiopathic (*Fig. 403*). This affects adolescents with a female to male ratio of 4:1.

**Kyphosis.**†—When kyphosis is present, pay particular attention to its type, whether it is a gentle curve or an angular deformity, having in mind the following aetiological table:—

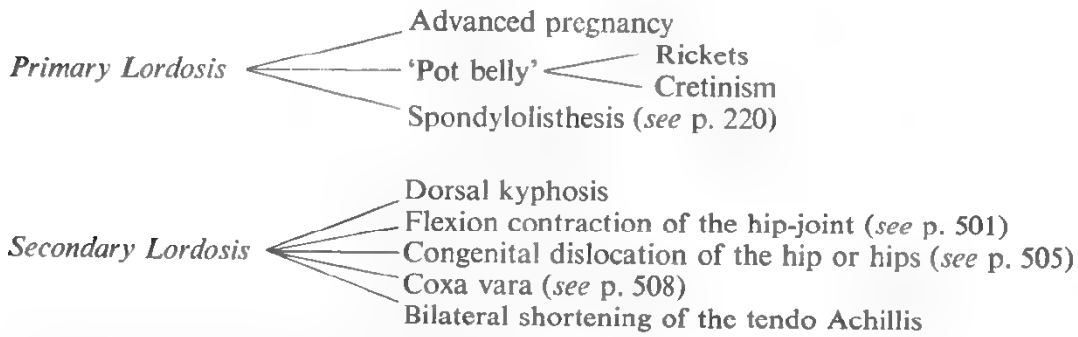


**Lordosis.**‡—The normal lumbar curve is exaggerated. That the depth of the normal lumbar furrow (*see Fig. 401*) produced by that curve is increased is best seen in an oblique light while viewing the patient's back in the usual way. On the other hand, gross lordosis is perceived at once when the patient is viewed from the side. While a protuberant belly produces lordosis, lordosis can cause a protuberant abdomen, and the clinician must decide which is primary. Lordosis, which is less common than kyphosis, can be primary or secondary.

\* *Scoliosis*. Greek, *σκολίωσις* = lateral curvature of the vertebral column.

† *Kyphosis*. Greek, *κύφωσις* — a knuckle; a hunchback.

‡ *Lordosis*. Greek, *λόρδωσις* — curvature of the vertebral column in a forward direction.



Continuing with the examination:—

**The Pointing Test.**—The patient should point to the place where pain is experienced. If this cannot be reached, the pointing finger must be helped. An exquisitely tender area may indicate a torn muscle-fibre or bundle. This area is marked on the skin. At the conclusion of the examination, sometimes it is of value to repeat the test. The visible skin mark can be used as a check of the patient's sincerity.

**Palpation** is of particular value in determining spasm of muscles that flank the spine. A spastic muscle feels firmer than normal. It is short, and therefore it causes concavity of the spine towards the side of muscular contraction (*see Fig. 412*). Tenderness may be due to local pathology or to irritation of the spinal nerves that supply the part. Next examine the spinous processes and the interspinous notches with the index finger. It is often valuable to commence this part of the examination by running the finger down the whole length of the spinous processes, commencing at the vertebra prominens.



*Fig. 405.*—Percussing the spinous processes of the vertebrae. A patient with senile osteoporosis complaining of backache.

**Vertebral Percussion.**—The spinous processes are struck with the percussing finger (*Fig. 405*) or a knee hammer. Commence at the vertebra prominens, and percuss each spinous process down to the second sacral. Tenderness over a

particular vertebra indicates disease. The method is of particular value in the dorsal region.

#### TESTING THE MOVEMENTS OF THE THORACOLUMBAR VERTEBRAL COLUMN



Fig. 406.—Flexion.

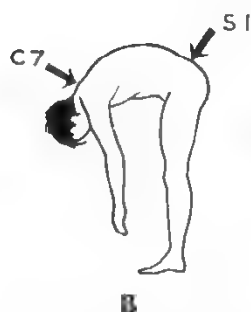
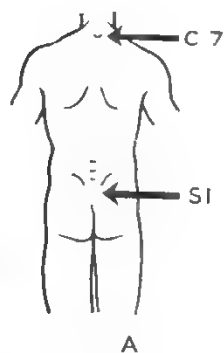


Fig. 407.—With the patient in the neutral position measure the distance between the spinous processes of C.7 and S.1 vertebrae (A) with a tape measure. Now ask him to bend forward as far as possible (B). In the normal adult male the tape should record an increase of 10 cm. between the two processes.



Fig. 409.—Lateral bend. An angle of  $35^\circ$  is normal.

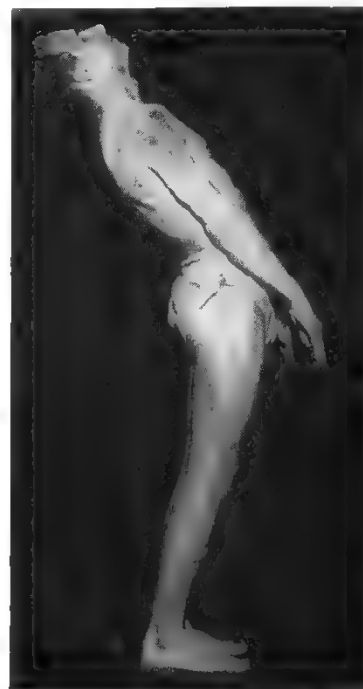


Fig. 408.—Extension. An angle of  $30^\circ$  with the vertical is possible in the normal patient.



Fig. 410.—Rotation. A  $45^\circ$  angle with the coronal plane is normally attainable

**Testing Spinal Movements.**—*Flexion* is the principal movement to be tested.

Most of the movement of true flexion of the spine occurs in the lumbar region; comparatively little in the thoracic, while in the cervical region normal flexion merely consists of the obliteration of the anatomical backward curve. It is only after it has been pointed out that one realizes the flexion of the spine *per se* is largely apparent and much of this movement occurs at the atlanto-occipital and hip-joints.

Ask the patient to bend forwards and endeavour to touch his toes, keeping the knees straight. The degree of flexion is measured by the distance between the

finger-tips and the ground (*Fig. 406*) or as shown in *Fig. 407*. With a young child, the test can be carried out without tears by dropping a coin or toy upon the floor and watching him pick it up. A normal child will pick up the coin by flexing the spine, or, at least, the spine will be flexed to a considerable degree. Should the child reach for the coin very cautiously by bending the knees it is obvious that spinal rigidity is present.

**Extension.**—Ask the patient to lean backwards as far as possible (*Fig. 408*), and observe whether this movement causes pain.

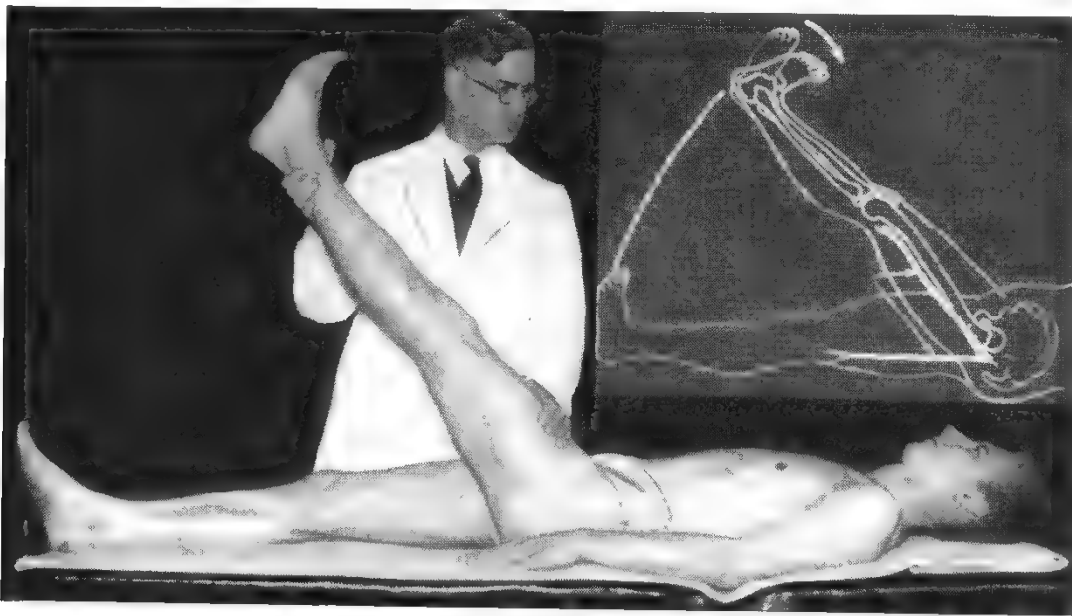
**Lateral Bend.**—The patient slides each hand in turn down the thigh (*Fig. 409*).

**Rotation.**—To obtain reliable results, the patient must be seated on a low backless stool or on a couch (*Fig. 410*). If on a stool, he should plant his feet on the floor; if on a couch, he must be seated so that the popliteal spaces rest on the edge of the couch. Thus the buttocks are anchored. The examiner then grasps the shoulders and rotates the patient's trunk to the right and to the left.

## B. EXAMINATION WITH THE PATIENT LYING DOWN.—

**Prone.**—The presence of muscular rigidity and the detection of areas of localized tenderness are best ascertained in this position.

In cases of sciatica the ankle-jerks (S.1) should be tested; often they will be found to be diminished or absent. The knee-jerks (L.4) are infrequently affected.



*Fig. 411.*—The straight-leg-raising test. Note the position of the clinician's hands. Normally the leg can be raised to 90° (slightly less as age advances).

### Supine.—

**In Cases of Scoliosis.**—Measurements of the length of the lower limbs (*see pp. 499 and 505*), and exclusion of deformities of the hip-joint are carried out.

**In Cases of Suspected Tuberculous Spondylitis**—Routine palpation of the abdomen is performed with a view to finding evidence of a psoas abscess.

**In Cases of Sciatica.**—Look particularly for a dropped big toe as lesions of L.5 nerve-root cause paresis of the dorsiflexors of the foot, and particularly of those of the great toe. In lesions of S.1 there is no such paresis (Norlén).

**The Straight-leg-raising Test.**\*—First ascertain that there is no compensatory lordosis by insinuating a hand beneath the lumbar spine (see p. 501). With one hand grasping the ankle and the other placed on the front of the thigh, to keep the knee straight, the leg is raised until the patient experiences pain, as evidenced by watching his face (Fig. 411) or until the normal excursion is accomplished. During the procedure watch the lumbar curve, a change of which invalidates the test. If the test produces pain below the normal full excursion, the angle at which the pain was experienced is recorded. The test is repeated, and as this angle is approached, additional care is exercised, and at the very first twinge of pain the hand resting on the thigh is moved to the fore-part of the foot, and the forefoot is dorsiflexed (Fig. 411, inset). Dorsiflexion of the foot affords additional traction to the sciatic nerve and aggravation of the pain therefrom suggests irritation of one or more of the nerve-roots that go to form the sciatic nerve.

The results of applying the straight-leg-raising test in some of the conditions considered in this chapter are as follows:—

1. In rigid kyphosis of adolescents (see p. 220) the raising is limited to 60° by tight hamstring muscles.

2. If pain is evoked under 40° it suggests that it is due to *impingement* of a protruding intervertebral disk on a nerve-root. When pain occurs only after the limb has reached a considerably higher level, it indicates that it is caused by *tension* on a nerve-root that is abnormally sensitive from a cause not necessarily an intervertebral disk lesion (Charnley).



Fig. 412.—Prolapsed intervertebral disk (L.3–4), showing sciatic scoliosis. The patient walked with his left hip-joint flexed.

**Rectal or Vaginal Examination.**—The importance of this cannot be over-emphasized in the search for a primary infection, or a neoplasm, as a possible cause of pain in the back.

### LOW BACK PAIN

In the following section the causes of this extremely common condition, sufferers from which throng general practitioners' surgeries and flood orthopaedic clinics, are discussed and the elicitation of relevant physical signs described.

**The Prolapsed Intervertebral Disk Syndrome.**—This may be due to extrusion of the disk in younger patients or to pressure on nerve-roots by osteophytes (spondylosis i.e., osteo-arthritis) in older persons. The first symptoms commonly appear in three ways: (a) Low back pain; (b) Sciatica; (c) Lastly (a) and (b) may occur in combination, appearing either simultaneously, or one following the other (usually (a) before (b)). Various combinations of acute and gradual onset also occur.

\* Laza K. Lazarevic, a Yugoslav physician, first described this sign in 1880. It is usually ascribed to E. C. Laségue, a French physician who in fact learnt it from one of his pupils, J. J. Forst, who described it independently in 1881.



Pain at first is located in the buttock. Soon it spreads to the back of the thigh and then increases in severity and radiates down the leg, sometimes to the great toe or to other toes. Pain with a distribution as wide as this must be due to involvement of one or more roots of the sciatic nerve (L.4-S.3).

*Characteristic Stance.*—In the throes of an acute attack the standing patient leans forward, so that the normal lumbar concavity is obliterated. The hip- and knee-joints on the affected side are flexed and only the ball of the foot touches the floor. Often lumbar scoliosis from muscular contraction is present (*Fig. 412*), the convexity usually, but not always, being directed to the side of the prolapsed disk (*sciatic scoliosis*).

While many of the following signs are present at all stages of an attack, it must be emphasized that the diagnosis does not hinge on any particular sign.

*Muscle Spasm.*—Spasm of the sacrospinalis is present uniformly. It is more in evidence on the side of the lesion.

*Pain* is distributed along the 4th or 5th lumbar or the 1st sacral dermatome, according to whether the L.3-4, L.4-5, or L.5-S.1 disk protrudes.

*Spinal Movements.*—Both flexion and extension of the spine are grossly diminished. Even in the acute phase, lateral flexion and rotation are comparatively free.

*Local Tenderness.*—It is usual to find deep tenderness 5 cm. lateral to the mid-line, the tenderness being more pronounced on the side of the protrusion, should that be unilateral (Armstrong).

*Vertebral Percussion.*—Tenderness is sometimes localized to the spinous process or processes in juxtaposition to the lesion.

*Straight-leg-raising Test.*—See p. 212.

*Coughing and Sneezing.*—Usually lower extremity pain is increased when intraspinal pressure is raised by these expulsive acts.

*Naffziger's Test.*—The pain is increased when the jugular veins are compressed for a few moments.

*Femoral Nerve Stretch Test.*—If pain is felt in front of the thigh (unusual) indicating that the protruding disk is L.2-3, ask the patient to lie on the abdomen again, and flex the knee → of the affected side. Should this manoeuvre reproduce the pain complained of, it is confirmatory evidence that a nerve-root component of the femoral nerve is being stretched over the disk.



*Remission of Symptoms.*—Complete remission of symptoms between attacks is characteristic of lumbar disk lesions. If a history of continuous low back pain or of sciatica is obtained, another cause should be suspected strongly and sought by all means available.

### THE SACRO-ILIAC JOINTS

From the standpoint of clinical examination this joint is extremely inaccessible, for it is completely protected by bone, except at one small area where the articular (so-called 'auricular', because it is ear-shaped) cartilage becomes subligamentous. This area, which is situated one finger's breadth medial to and one finger's breadth below the posterior superior iliac spine affords the principal opportunity of ascertaining whether the joint is tender

*The Pointing Test.*—Ask the patient to point to the site of maximum pain.

Typically the finger points to the surface marking of the sacro-iliac joint, which sometimes is identified so conveniently by a dimple (*see Fig. 401*).

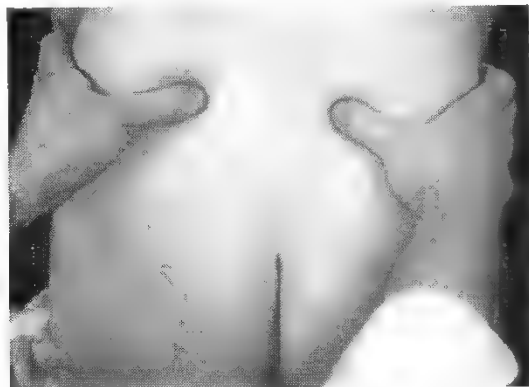
*Forward Bending.*—Ask the patient to bend forward and endeavour to touch the toes (*see Fig. 406*). Usually, but not necessarily, this movement is performed hesitatingly and incompletely. If it is *pain* that prevents flexion of the back, again ask the patient to put his finger on the place that hurts him most.

Now request the patient to sit and bend forward (*see Fig. 417*). In sacro-iliac lesions this movement is now comparatively free, because the pelvis is supported.

*Rotation of the vertebral column* (*see Fig. 410*) is extremely important. In sacro-iliac affections it always brings on, or intensifies, pain at the affected joint.



*Fig. 413.*—Palpating the left sacro-iliac joint. When no dimple overlies the joint, locate the posterior superior iliac spine and take bearings from this point.



*Fig. 414.*—Deep comparative palpation of the sacro-iliac joints. Exercising considerable pressure, first one thumb and then the other passes over the joint. The left thumb is performing the movement at the time of the photograph.



*Fig. 415.*—The 'pump-handle' test.

*Palpation.*—Tenderness over the sacro-iliac joint and nowhere else strongly suggests a lesion of this joint. Especially when the overlying dimple is present, the joint (*Fig. 413*) is located easily. In other circumstances it is best to follow the iliac crest in a backward direction until the posterior superior iliac spine is reached, and then take bearings from this eminence as described already. A good practical method is, with the patient sitting erect, to place the thumb just medial to the posterior iliac spine and, while exerting pressure, ask the patient to bend forward slowly. By his so doing the thumb passes over the joint cleft (*Fig. 414*) and when it reaches the portion unprotected by bone, if the sacro-iliac joint is involved the patient will flinch and exclaim, 'That is the place'.

**The Straight-leg-raising Test.**—Except in cases of sacro-iliac tuberculosis where abscess formation has involved the nerve-trunks, the straight-leg-raising test can be performed to its full extent with, perhaps, the production of slight pain in the region of the affected joint at the zenith of the arc of elevation.

**The 'Pump-handle' Test.**—With the patient supine and commencing on the pain-free side, grasp the limb just below the knee, and in order to steady the trunk, with the free hand grasp the shoulder on the same side. Fully flex the hip and the knee-joints, then, by firm pressure, direct the flexed knee steadily towards the opposite shoulder (*Fig. 415*). This completed without undue discomfort to the patient, proceed to perform the test on the suspected side. The test is positive if pain is experienced in the sacro-iliac joint.

The main affections of the sacro-iliac joint are, in order of frequency, sacro-iliac strain, sacro-iliac arthritis, and sacro-iliac tuberculosis.

**Sacro-iliac Strain.**—The great majority of patients with pain localized to a sacro-iliac joint are said to be suffering from 'sacro-iliac strain', but it must be admitted that the causative pathology is unknown. The above tests for sacro-iliac pain are positive but straight leg raising is normal as are the X-rays and the blood-sedimentation rate.

**Sacro-iliac Arthritis** is uncommon. It may be a complication of chronic prostatitis, and especially so of Reiter's disease (*see p. 449*), in which it is present clinically in 20 per cent of cases. It is unusual for the sacro-iliac joints to be spared in ankylosing spondylitis (*see p. 220*) and some patients with ulcerative colitis exhibit clinical sacro-iliac arthritis. In a number of instances no cause can be found. Needless to say, other major joints should be examined for evidence of similar involvement.

The leading symptom is painful stiffness of the lower part of the back, most in evidence first thing in the morning, and usually of a band-like distribution across the sacrum and buttocks. Sometimes there is a limp or, if the condition is bilateral, a slightly stiff, waddling type of gait.

**Tuberculosis of the Sacro-iliac Joint** is rare, but its occurrence is one of the important reasons why all patients with persistent low back pain should have an X-ray examination. Contrary to all other forms of joint tuberculosis this is a disease of young adults, 80 per cent of cases occurring between the ages of 16 and 35 years of age (*Seddon*). In only about half is the pain localized, mainly in the region of the sacro-iliac joint. Low central backache, pain in the groin (which is likely to be attributed to arthritis of the hip-joint), and sciatica are frequent. During the stage of intra articular abscess formation the pain is severe, and starting pains (occurring chiefly at night) are typical. When the pus has eroded the ligamentous covering of the joint, it manifests itself as a fluctuating swelling, and, intra-articular tension being relieved, the pain ceases. About 65 per cent of the abscesses appear over the sacro-iliac joint; the remainder track forward into either the groin or the iliac fossa. Exceptionally, such an abscess appears in the femoral triangle.

### THE LUMBOSACRAL JOINT

**Lumbosacral Strain.**—The patient is often between 25 and 50 years of age, and usually is a female. The pain, which is situated near the top of the sacrum, is of a nagging character, and often radiates to the front and lateral aspect of the thigh. Such pain is increased by bending forward, as in many household tasks, and it is especially in evidence at the end of the day. Routine examination is mostly negative, but positive information is forthcoming if attention is focused on the lumbosacral articulation in the following ways:—

There is a slightly increased concavity of the lumbar curve and some spasm of spinal muscles during active movements of the spine. Forward bending is limited *both when standing and sitting*.

Request the patient to lie flat on her back on the examining couch while the clinician becomes otherwise occupied for a few minutes. Note the posture assumed. Often the patient finds lying flat on the back intolerable, and after a short while flexes both knees and hips.

**The Straight-leg-raising Test** can be performed with freedom on either side, but with some pain located in the lumbosacral region at the zenith of the elevation.

The patient should now be examined prone, with four pillows beneath the pelvis. This opens up the gaps between the lower lumbar spinous process and facilitates palpation (Fig. 416) of the supraspinous ligaments. The greatest tenderness is elicited either just below or just above the spinous process of the 5th lumbar vertebra. Sometimes a depression denoting damage to, or laxity of, the supraspinous and interspinous ligaments (*sprung back*) contrasts sharply with the normal resistance of intact ligaments between the lumbar vertebrae higher in the series.



Fig. 416.—Lumbosacral strain. With four or five pillows beneath the abdomen, the lower intervertebral spaces are rendered more accessible while the palpating finger is directed particularly to the space below and the space above the 5th lumbar vertebra in the middle line.

#### LOW BACK PAIN WITHOUT PHYSICAL SIGNS

It must be admitted that, in practice, of patients with the complaint of low back pain, at least half fall into the category of 'no physical signs'. If, after a reasonable trial of simple methods of treatment, a radiograph is ordered, it is always normal or shows a condition which does not account for the pain (e.g., spina bifida occulta, *see* p. 205). An additional confirmatory scientific test is that the blood sedimentation rate is normal.

**Fibrositis, Myofascial or Back Strain, Lumbago, and Muscular Rheumatism** are terms which can be applied (with tongue in cheek) in these circumstances, provided

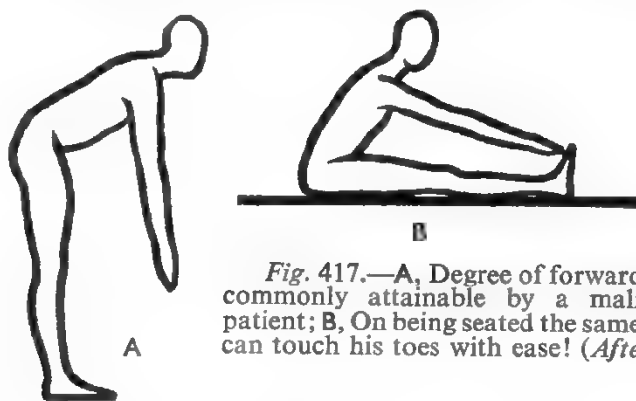


Fig. 417.—A, Degree of forward flexion commonly attainable by a malingering patient; B, On being seated the same patient can touch his toes with ease! (After Aird.)

that the methods of physical examination so far considered (including rectal and vaginal examination) have been carried out conscientiously with negative results and that X-rays are normal. Physiotherapy often relieves the pain although it would be pretentious to claim that the treatment has cured the condition, as the cause is not known. In this connexion it may be added that osteopathy, or other

methods of manipulation are not to be scorned; although the reasoning behind the treatment is illogical, it does produce good results on occasion.

If pain persists, consider the following:—

**Malingering's Low Back Pain.**—The patient usually has a good reason (compensation) for persistence of pain. Helpful in the diagnosis is that the expression 'agony' is often used, yet the patient shows no sign of severe suffering. A frequent additional complaint is headache. An inquiry into the general health is liable to evoke an account of many and varied symptoms elsewhere. Two tests are of value in confirming functional backache.

1. *Aird's Test.*—The standing patient is asked to touch his toes with the knees straight. If flexion of the spine is greatly reduced, ask the patient to sit down on an examining couch and touch his toes. If his pain has a non-organic basis he will be able to do so with ease; it requires no genius to realize that the spinal flexion is identical with that necessary to touch the toes when standing (*Fig. 417*).

2. *Magnuson's Test.*—Ask the patient to point to the site of the pain and mark the area. Then look at the patient's throat, examine him rectally, and perform



*Fig. 418.*—Without hesitation the patient points to same spot as he did at the first examination. Undoubtedly a case of genuine pain.



*Fig. 419.*—Migratory localization of maximum site of pain; probably malingering or possessed of a high degree of 'compensitis'.

any relevant examination of parts well away from the site of the alleged pain. By this expedient the patient's attention is diverted (from his back) for several minutes. The examination of the back is then resumed. If the man experiences real local pain, assuredly its position will remain steadfast (*Fig. 418*). If he is malingering, he may not remember the exact place where he located the pain (*Fig. 419*), or which area or areas he said were tender.

### SPECIFIC CAUSES OF SPINAL DEFORMITY

**Pott's Disease (Tuberculous Spondylitis).**—The most common (about 40 per cent) variety of bone and joint tuberculosis is in the spine. The symptoms and signs vary according to the level of the lesion, which commences in the cancellous bone of a body of a vertebra adjacent to an intervertebral disk; the most common region to be affected is the lower thoracic and upper lumbar. Certain symptoms and signs are common to all regions:—

*Pain* is nearly always localized to the site of the lesion; occasionally it is referred, e.g., along an intercostal nerve or nerves. Absence of pain should not mislead

IAN AIRD, 1905–1962, *Professor of Surgery, University of London.*

PAUL B. MAGNUSON, *Formerly Professor of Surgery, North-western University, Chicago.*

PERCIVAL POTT, 1714–1789, *Surgeon, St. Bartholomew's Hospital, London, described painful deformity of the spine with paraplegia, which he considered to be due to tuberculosis.*



the clinician, for the disease can progress with so few symptoms that the patient follows his calling until the onset of paralysis, or the formation of a large abscess.

*Night Cries* occur in children. They are caused by pain resulting from relaxation of the involuntary muscular spasm that splints the intervertebral joint.

*Evening Pyrexia* is likely to develop as the disease progresses, and with it lassitude, anaemia, and poor appetite—all of which are signs of toxæmia.

*Muscular Rigidity*.—Protective muscular spasm, especially of the sacrospinalis, develops early. In the adult flexion is greatly reduced; in a child the coin-dropping test (*see p. 211*) is regularly positive.

A sign peculiar to the thoracolumbar region is: 'If a deepened midline spinal sulcus is seen about the tenth thoracic vertebra you have noticed the first sign of Pott's disease in its earliest stages at the most frequent site. This deepened sulcus is due to increased muscular tonicity of the sacrospinalis muscles; it is Nature's plaster cast' (Jardine).

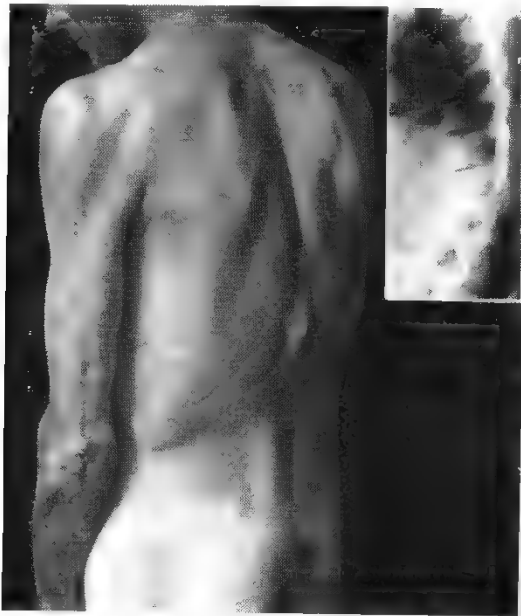


Fig. 420.—Pott's disease. Angular deformity. Inset, collapse of a vertebral body.



Fig. 421.—Psoas abscess from Pott's disease of a lumbar vertebra. The patient had so few symptoms that he did not report before the abscess had reached these dimensions.

*Angular Deformity*.—It is not long before the anterior portion of the vertebral body most affected softens and collapses, producing the characteristic angular deformity. To see the prominence (of the spinous process) so caused to the best advantage, the patient should be viewed from an oblique angle (*Fig. 420*).

*Vertebral Percussion* reveals tenderness over the process or processes concerned in the angulation.

*Referred Pain*.—Pain from spinal lesions sometimes is referred to other sensory fibres proceeding to the same nerve-root. Thus Pott's disease has been mistaken for pleurisy, appendicitis, and sciatica. This emphasizes the necessity for routine examination of the back when pain is situated in the abdomen or thorax.

*Abscess Formation*.—An abscess connected with an upper thoracic vertebra is wont to point in the mediastinum, and may rupture into the pleural cavity. Alternatively, it follows the course of an intercostal nerve and points in the lateral aspect of the chest (*see p. 192*). In the lower thoracic and upper lumbar regions the pus enters the psoas sheath and tracks downwards causing a mass in the iliac fossa.

Later, it points beneath the inguinal ligament, and if its contents are not aspirated the abscess spreads subcutaneously (*Fig. 421*).

**Paraplegia** is caused by compression of the spinal cord by granulation tissue, oedema, or extreme kyphosis. Muscular weakness in the lower extremities is followed by exaggerated reflexes, ankle clonus, and finally paralysis. Formerly common, paralysis now supervenes in only a small and decreasing proportion of cases, due to more efficient treatment.

**Non-tuberculous Spondylitis.**—The frequency with which the vertebrae are attacked by tuberculosis tends to obscure non-tuberculous osteitis of the spine which, like Pott's disease, is the local manifestation of a general disease. Like osteomyelitis of a long bone, the onset of non-tuberculous spondylitis is either acute or subacute but, unlike that condition, the infecting organism is far from stereotyped.

Obviously the nature of the infecting organism cannot be diagnosed by clinical methods, but often it can be strongly suspected. For instance, in communities where typhoid is common, typhoid spondylitis occurring many months after the illness is by no means a rarity in adults. On the other hand, in rural communities where goats are kept, spondylitis due to brucellosis occurs from time to time. Therefore, in a child, always examine the spleen and the lymph-nodes for enlargement. In areas where hydatid disease is endemic it can cause spondylitis. Apart from actinomycosis, other less well-known fungus infections, notably coccidioidomycosis,\* attack the vertebral column. The latter is endemic in California, Central America, and in parts of Canada. Intradermal tests and biopsy alone can differentiate this infection from tuberculous spondylitis.

**Post-traumatic Kyphosis** (Kümmell's Disease) is a prerogative of the adult spine. Following an injury to the vertebral column and apparent recovery, weeks or months later painful kyphosis of the thoracic region develops due to osteoporosis culminating in collapse of a body of a vertebra. It is thus the result of an unrecognized fracture of a body of a vertebra.

**Angular Kyphosis due to a Metastatic Tumour in a Vertebra.**—The body of a vertebra is a favourite site for a carcinomatous deposit, the lumbar vertebrae being rather more commonly involved than the others. The primary growth can be situated in any of the organs listed on p. 190, but with vertebral metastases the breast, bronchus, and the prostate are the most frequent sites of origin. Often the clinician knows that the patient has had a carcinoma treated.

Most secondary deposits in bone are osteolytic, and in the spine such bone destruction commonly results in vertebral collapse and spinal cord compression. A few secondary deposits—particularly some of those of prostatic origin—are osteosclerotic, producing new bone by osteoblastic activity. In this instance pathological fractures do not occur, but the spinal cord or nerves become compressed.

Usually there is a short, sometimes an abrupt, history of pain in the back, and often in the case of an osteolytic metastasis suddenly the vertebra collapses, possibly as a result of slight trauma. On examining the back an angular deformity may be apparent. In untreated cases after a period varying from a few days to weeks, the pain becomes worse and neurological signs commence in the legs.

After secondary carcinoma, reticulosis including multiple myelomatosis (*see* p. 433) is the most common neoplastic condition to involve the spine.



*Fig. 422.*—Ankylosing spondylitis.

\* Coccidioidomycosis mainly affects cattle, sheep, dogs, cats, and some rodents in the form of purulent mesenteric lymphadenitis.

**Ankylosing Spondylitis** ('Poker' Back) occurs predominantly in males of military age. When the disease has developed fully the patient adopts a characteristic stance. The back forms a continuous curve from the base of the skull to the sacrum. The lower abdomen is protuberant (Fig. 422). Often the knees are bent to maintain balance. Chest expansion is permanently and grossly reduced. When the condition is developing the chief complaint is low backache and/or buttock-ache typically on rising in the morning. Tenderness over bony prominences usually is present. The

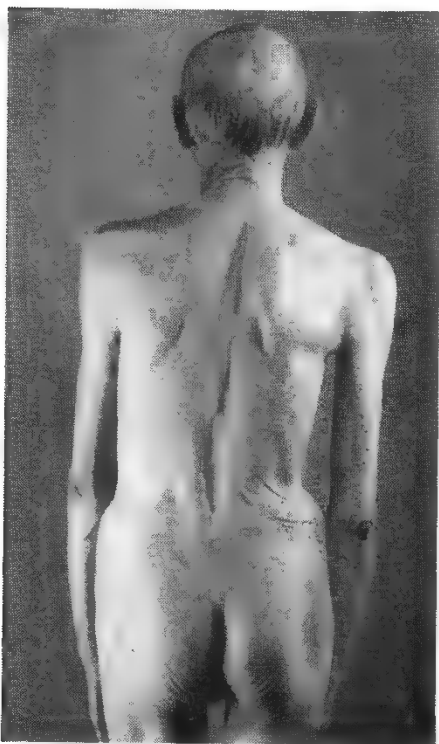


Fig. 423.—Spondylolisthesis. Demonstrating the transverse loin creases.

common sites for such tenderness are the ischial tuberosities, the greater trochanters, the anterior superior iliac spines, and the heels. In early cases there is tenderness over the manubriosternal joint. Iritis is a relatively common complication. The co-existence of non-specific urethritis or Reiter's disease (see p. 449) always should be investigated by an appropriate prostatic-urethral examination. Very frequently ankylosing spondylitis is associated with sacro-iliac arthritis (see p. 215).

**The Rigid Kyphosis of Adolescence** (Scheuermann's Disease).—Unlike postural kyphosis, the curvature cannot be straightened by muscular effort. The parents complain that the child (13 to 16 years of age) is becoming increasingly round-shouldered. Inspection reveals a rounded thoracic kyphosis and in pronounced examples a compensatory lumbar lordosis, which in middle life becomes the seat of low back pain. Straight leg raising (see p. 212) may be limited by tight hamstring muscles.

**Kyphosis in the Elderly.**—*Senile Kyphosis* is a common deformity characterized by a gradually increasing stoop with a forward thrust of the neck. There is no pain, unless associated with other spinal disease.

**Senile Osteoporosis.**—Usually the patient is thin, and a woman (see Fig. 405), sometimes with peculiar dietary habits.

**Paget's Disease of Bone.**—Almost without exception, there are signs elsewhere (see p. 435).

Finally, it should be remembered that kyphoscoliosis is a part of *von Recklinghausen's neurofibromatosis*. In this instance the deformity commences in early middle life, and in such patients, as well as in the elderly, the body surface should be inspected for the characteristic nodules (see Fig. 63, p. 29).

**Spondylolisthesis.\***—The affected vertebra (often the fifth, but sometimes the fourth, lumbar vertebra) slips forwards because of a defect of the pars interarticularis. It is found in about 5 per cent of radiographs, the patient having no symptoms referable to the condition. When symptoms arise, they do so because the relevant

\* *Spondylolisthesis*. Greek, σπόνδυλος = a vertebra + ὀλισθάνειν = to slip. In this instance, slipping forwards.

spinal nerves have been carried forward with, and become constricted by, the edge of the slipped vertebra.

The awkward gait occasioned by *considerable* spondylolisthesis is reminiscent of that of bilateral congenital dislocation of the hips—an erroneous conclusion that can be disproved easily (see Trendelenburg's Sign, p. 507). The physical signs of spondylolisthesis are increased lumbar lordosis (see Fig. 402 C) associated with a transverse loin crease or creases (Fig. 423) of the skin and subcutaneous tissues in the immediate vicinity of the subluxation. Such flexion creases often become apparent, or more apparent, when the patient is viewed from the lateral aspect. From this aspect also, in well-marked examples, the sacrum appears to extend to the waist. On running the finger down the lumbar spinous processes, as the lowest process in the series is reached, suddenly the finger sinks into a deep recess, and as it emerges therefrom it encounters a sharp ridge, viz. —————→



which is the superior border of the sacrum. Where symptoms arise, the first complaint is of low back pain and stiffness after exercise. Restriction of flexion, as demonstrated by bending, is present. Pain referred to the 4th or 5th lumbar dermatome is not infrequent.

### FRACTURED SPINE

In 84 per cent of cases of fracture of the spine occurring in civil life, the spinal cord is undamaged (Nicoll), and consequently these fractures should not necessarily be enshrouded with the atmosphere of calamity that sometimes prevails. Preliminary clinical examination is best conducted by rolling the patient gently on to one or other side without twisting the vertebral column so that three or four persons are required to turn the patient, one being delegated to control the head. In addition radiological examination is essential in suspected cases.

**1. Fracture of a Spinous Process** (10 per cent), which nearly always occurs near the cervico-thoracic junction where these processes are long and thin, can result from direct violence. More often, because the spinous process gives attachment to the sacrospinalis, violent muscular contraction produces an avulsion fracture. There is sudden and considerable pain extending from the neck to the shoulder, aggravated by flexion or rotation of the neck. Pressure over the fractured vertebra produces exquisite tenderness. Lateral mobility of the process can sometimes be elicited.

**2. Fracture of a Transverse Process** (30 per cent) is confined to the lumbar region. While it can result from a blow on the loin (in which event the urine should be examined for the presence of blood), usually it is produced by violent muscular action. These transverse processes give attachment to very powerful muscles—the psoas, quadratus lumborum, and the deeper part of the sacrospinalis. When they contract strongly, as in sudden flexing or twisting, they can snap one or more of the transverse processes across the middle. The back is very painful and acutely tender to one side of the middle line. Pressure over the spinous processes is not painful. Any attempt at movement results in muscular spasm. If a patient with this injury (or (1) above) is told that he has a 'fractured spine' neurosis resulting in continuous backache on exertion is a frequent aftermath.

**3. Fracture of a Lamina** (5 per cent) is difficult to detect, and is often associated

with a fracture of a transverse process or processes. The lesion occurs in the lowest part of the lumbar spine.

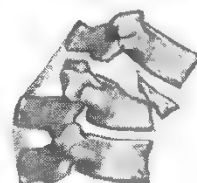
**4. Compression (Crush) Fracture of a Body of a Vertebra** (40 per cent) is commonly confined to the thoracic and lumbar regions. It is produced by hyperflexion such as would be occasioned by a heavy fall of coal on to a miner's shoulders while his back is bent, or by direct violence such as falling on the feet from a height. The former is more common.

*Stable Compression Fracture* (interspinous ligament intact). Occasionally slight kyphosis —————→ is visible. Pressure on the spinous process of the affected vertebra evokes unmistakable tenderness.



*Unstable Compression Fracture* (interspinous ligament torn). At the moment of impact the articular facets slide on one another, separate, and then, on recoil, do not necessarily slide back into correct position, and so become locked. The spinal column is unstable and the contents of the spinal canal are exposed to future injury unless the locked facets are unlocked and the spine fixed. It is highly important to recognize this condition, which can be diagnosed entirely by clinical examination. Irrespective as to whether or not kyphosis is visible or palpable, on running the finger down the spinous process *a gap can be felt between two adjacent spinous processes*.

**5. Fracture-dislocation** (10 per cent). Air travel, motor-cycling, coal-mining, and horse-riding account for many of these injuries that are the result of violent hyperflexion of the spine. The interspinous and other ligaments are ruptured, which allows the posterior intervertebral joints to dislocate. The angular deformity can always be felt as an unmistakable gap between the spinous processes —————→ of the implicated vertebrae. Fifty per cent of fracture-dislocations of the vertebral column are associated with damage to the spinal cord or the cauda equina, causing varying degrees of paraplegia or tetraplegia.



#### SPECIAL FEATURES OF INJURIES OF CERVICAL VERTEBRAE:—

**Flexion Fracture.**—Typically this is the result of diving into shallow water and striking the head on the bottom. Usually the 5th vertebra is fractured. If the injury is not fatal or complicated by tetraplegia, the patient can walk without supporting his head with his hands. Movements of the neck are almost completely restricted by pain. There is acute tenderness over the spinous process of the affected vertebra, which may be somewhat more prominent than normal.

**Hyperextension Partial Dislocation.**—Relatively minor falls or blows on the forehead may result in sufficient hyperextension of the neck to rupture the anterior longitudinal ligament —————→ The patient, often over 40 years of age, sometimes has a tell-tale bruise on the forehead. The fact that partial paraplegia is a frequent accompaniment of this seemingly minor injury astounds the clinician unfamiliar with this particular accident.



**Paraplegia associated with Cervical Spondylosis or Prolapsed Disk.**—The above mechanism may be the cause, the spinal canal being narrowed by an osteophyte or the disk protrusion. Thus partial paraplegia occurs without rupture of the anterior longitudinal ligament.

Occasionally a laterally protruded disk causes the *Brown-Séquard Phenomenon*.—With pressure on one side of the spinal cord there is dissociation of loss of power and loss of sensation; thus the leg that exhibits most muscular weakness reveals little or no loss of pin-prick sensibility, whereas the relatively strong leg shows diminished response to painful stimuli. The phenomenon



is, of course, explained by the decussation of the sensory fibres in the spinal cord and is also caused by spinal tumours.

**Fracture of the Atlas.**—If not fatal immediately, the patient supports his head in his cupped hands, and is unable to nod. He complains of severe occipital headache. The diagnosis must be suggested by clinical examination, for radiographic evidence of this fracture is sometimes not to be relied upon.

**Fracture of the Odontoid Process** is another result of a diving accident. More often than not, immediate death occurs from damage to the brain-stem. In cases where the contents of the neural canal escape damage, not only can the patient walk, but he holds his unsupported head erect. However, he is quite unable to rotate the head and this is the only physical sign. Unless the condition is diagnosed and the head and neck are completely immobilized, the patient is in dire danger of sudden death. Routine radiographs are often unhelpful, the clearest views being obtained with the mouth widely open.

**Subluxation of the Atlanto-axial Joint** due to softening of the transverse ligament of the atlas in septic processes, notably retropharyngeal abscess and tonsillitis, occurs in children, but is a rarity. Again, the patient supports the head with the hands and will not perform nodding actions. The dangers are as above.

In summary therefore, leave no diagnostic stone unturned if a child or adult complains of pain in, and/or exhibits limitation of movement of, the neck after an injury, however trivial.

### THE SPINAL CORD

In an adult the cord ends at the lower border of the 1st lumbar vertebra, to give place to the cauda equina; above this level, therefore, a lesion is of the spinal cord, and below this of the cauda equina. In the case of the spinal cord, one of the first thoughts of the clinician is 'At what level is the lesion?' The student is referred to works on neurology for help in answering this question. Tumours are also out of our field. Remember, however, that a child, complaining of backache in whom none of the signs or X-ray changes of Pott's disease (*see* p. 217) can be found, may be suffering from a spinal tumour, and obtain a neurological opinion.

### INJURIES OF THE SPINAL CORD

The complication of a fractured vertebra that transcends all else in importance is injury to the spinal cord. In civil life most injuries are due to indirect violence, and most common site of the lesion is about C.6, due to force applied from above. The second most frequent site (due to force applied from below) is in the region of L.1. The thoracic region is seldom involved.

In a conscious patient who is known to have sustained an injury to the vertebral column, the immediate recognition of a concomitant injury to the spinal cord is seldom a problem. Provided the aid of the simple tests given below is invoked, no particular difficulty cloaks the recognition of a spinal injury in a comatose patient. The difficulty is in the case of multiple injuries, now common as the result of aeroplane and high-velocity automobile accidents. A bleeding head or a fracture of an extremity frequently attracts so much of the clinician's attention that injury to an internal organ or to the spine is overlooked.

At this juncture let it be assumed that a patient with suspected injury to the spine is about to be admitted. The clinician on duty should proceed as follows:—

If possible, examine the back as described on p. 221. This saves unnecessary movement. The important thing to look and feel for is an angular deformity and/or a gap between the spinous processes as described on p. 222, remembering that such

findings are rare and occur only in gross fractures; incidentally, signs of local bruising should be noted.

**A. In a Conscious Patient** continue thus:—

**Motor Power.**—Ask the patient to move his legs. If he can draw up both legs, one can be certain that there is no serious damage of the spinal cord. If only one leg is drawn up, do not jump to the conclusion that there is a unilateral lesion. Examine the immobile thigh and leg for local injury, remembering particularly fractured neck of the femur.

When the patient cannot move either of his legs:—

Test the movements of the arms. If the arms are paralysed, their position may be the key to the level of the lesion.



Fig. 424.—The attitude of a patient with a lesion at the level of the 6th cervical vertebra.



Fig. 425.—The attitude in a lesion at the level of the 7th cervical vertebra.

**Level of C.5.\***—Arms completely immobile by the sides.

**Level of C.6.**—Arms held above the head, elbows flexed, forearms supinated, hands half-closed (Fig. 424). This posture is due to irritation of the 5th segment, and consequent spasticity of muscles supplied by it (supraspinati, biceps, deltoid, brachialis, and supinators).

**Level of C.7.**—Half-closed hands with the elbows flexed assume the position shown in Fig. 425. This is due to irritation of the 6th segment with spasticity of the serratus anterior, part of the pectorals, and the pronators.

**Level of T.2.**—Often there is contraction of the pupils, owing to irritation of the ocular motor fibres which leave the spinal cord at the segment above.

The abdomen should be inspected. When respiration is purely *abdominal* (diaphragmatic) it implies that the intercostal muscles are paralysed. The lesion is situated, therefore, above T.2.

Before completing the abdominal part of the examination percuss the bladder: retention of urine is usual when the spinal cord is damaged. A lesion above T.6 results in paralysis of the muscles of the abdominal wall. Between T.6 and T.12 the lower the lesion, the more the muscles of the abdominal wall will be spared. In relevant cases consider the possibility of a fractured pelvis (*see p. 338*).

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\* *Above C.5.*—Transection is fatal because all the respiratory muscles, including the diaphragm (supplied by the phrenic nerve), are paralysed. This occurs in judicial hanging.

*Sensation* should be tested with a pin. A band of hyperaesthesia at the level of the lesion, with anaesthesia below, is indicative of a grave injury to the spinal cord.

*Reflexes*.—At this stage the reflexes below the level of the lesion are in abeyance, as is described in the section on spinal shock (*see below*).

**B. In an Unconscious Patient** the absence of deep reflexes and failure to obtain reflex movement to painful stimuli such as pinching in the lower part of the body, yet being able to obtain responses over the arm and shoulder, indicates a concomitant lesion of the spinal cord. If no response is obtained at any level, the examination must be repeated at intervals. In these circumstances no conclusion can be drawn until consciousness or semi-consciousness is regained, or responses are obtained over the upper extremities, whichever should happen first.

Injury to the spinal cord manifests itself in three forms, namely, cord concussion, cord transection, and root transection. The first can terminate in complete recovery, or give place to the second or to the third, or a combination of the second and third.

**Cord Concussion** (a state of *spinal shock*) gives rise to sensory loss, *flaccid* paralysis, and visceral paralysis (abdominal distension due to paralytic ileus, retention of urine) below the level of the lesion. When raised, the affected limb falls like a log. Reflexes are in abeyance. In addition to testing the usual reflexes, the anal reflex provides a valuable sign.

*The Anal Reflex*.—In normal circumstances, when a finger is inserted into the anal canal the finger is gripped tightly by the external sphincter. When this reflex is lost the anus remains open ('yawns') for several seconds. For obvious reasons this must be tested in the dorsal position (*see p. 275*).

Eight hours after its onset cord concussion commences to regress. The condition is completely reversible, and when present alone, complete recovery can be expected within 7 to 10 days.

**Cord Transection**.—As a result of the trauma, the cord can be wholly or partly transected. At first the signs are those of cord concussion. As this passes off, the part of the spinal cord below the lesion, bereft of the controlling influences of the brain, acts as an independent unit in that it mediates reflex activity. In a matter of hours the anal reflex returns. The *penile reflex* becomes active (erection occurs on slight cutaneous stimulation of the organ). In 1 to 4 weeks the stage of spinal shock passes off. The flaccid paralysis becomes spastic (extensor plantar reflex), tendon reflexes return and become much exaggerated, clonus is present, retention of urine is usual, lost sensation never returns. *The presence of anal and penile reflexes in the absence of sensation below the injured segment is diagnostic of cord transection*, and enables a decision to be reached that the lesion is anatomical and irreparable long before spinal automatism ensues.

*The Reflexes of Spinal Automatism*.—Pinch the skin of the dorsum of the foot vigorously. In normal individuals the withdrawal from the noxious stimulus is a quick one—all the joints of the lower extremity flex. When the spinal cord has been transected, and the stage of spinal shock is waning, the first sign of returning function in that part of the cord isolated from the brain by transection is contraction of the hamstrings with flexion of the big toe. A few days later, when the stage of spinal shock has passed off completely—

*The Flexor Withdrawal Reflex of the Lower Extremities* is obtained. In the paraplegic the reaction is *slower* than normal, and while the hip-, knee-, and ankle-joints flex, the big toe moves *upwards*. If the lesion is above T.12 and the patient is lean, it will be seen that the muscles of the abdominal wall participate in the flexor reflex by contracting slowly.

*The Mass Reflex.*—When the 'flexor state' (Riddoch) is at its height, a small stimulus such as pricking the inner side of the thigh, or drawing the prepuce over the erect penis, brings about not only the flexor reflex, but an evacuation of the bladder and sometimes of the rectum also.

**An Incomplete Lesion.**—The stimulus (pinching the dorsum of the foot) will bring on much less pronounced flexion than when the lesion is complete, and the semiflexion thus produced *is followed after a time by extension*. A reaction of flexion followed by extension is therefore very much in favour of an incomplete lesion.

**Root Transection** differs from cord transection in that the paralysis remains flaccid.

**Traction Birth Injury of the Spine** occurs particularly during delivery of the aftercoming shoulders and head in breech delivery. The paraplegic infant lies in a characteristic position with the legs limp and everted in a frog-like posture. There is no involuntary motor response or cry of pain in response to stimulus. The bladder soon becomes palpable.

**Haematomyelia** implies a focal extravasation of blood within the spinal cord not the direct result of a fracture or a haemorrhagic diathesis. Sometimes the haemorrhage occurs into a syringomyelic cavity; at others, the symptoms arise without warning. Not uncommonly the condition is attributed to a comparatively remote event that is supposed to have exposed the spinal cord to transmitted violence, though often this trauma seems slight compared with the severity of the resulting symptoms. Most frequently it is a young woman who is stricken, and it is the cervical region that is affected most commonly, in which event the symptoms and signs are identical with those of tetraplegia resulting from a dislocation, a fracture, or a fracture-dislocation of a vertebra. Apart from transection following a fracture, there is no condition in which a lesion of the spinal cord develops so rapidly as haematomyelia.

#### INFLAMMATION OF THE SPINAL MENINGES

An epidural (extradural) abscess is a sequel of acute pyogenic osteomyelitis of a vertebra. Pain starts in the back with exquisite localized tenderness. Vertebral percussion (*see p. 209*) is positive. After a day or two the pain radiates forward on one or both sides owing to pressure on nerve-roots (*cf. herpes zoster, see p. 328*) and mimics intra-abdominal or intrathoracic disease. By this time the patient has a high pyrexia, is manifestly severely ill, and may exhibit rigors. Antibiotics may mask the other signs of acute osteomyelitis (*see p. 425*) but spinal tenderness and rigidity remain undoubtedly present.

#### CAUDA EQUINA LESIONS

A space-occupying lesion within the neural canal below the level of the 1st lumbar vertebra compresses the cauda equina. Such lesions comprise tumours, Pott's disease, fracture-dislocation of the lumbar spine, and protrusion of L.5-S.1 intervertebral disk.

*Sensory Signs.*—One of the most salient features of a lesion of the cauda equina is an area of saddle-shaped hyperaesthesia, and later of anaesthesia, which, as its name implies, represents an area over both buttocks, the anus, and the perineum. This can be tested with a pin, starting near the anus and working laterally until normal sensation is appreciated.

*Motor Signs* are a *flaccid* paralysis of the muscles of the leg below the knees.

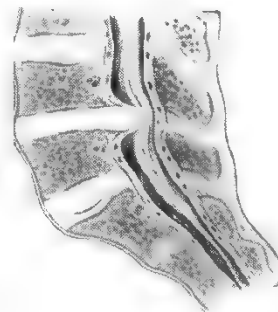
*Reflexes.*—The ankle-jerks are absent, but the knee-jerks are often accentuated owing to the weakness of the opposing hamstrings.

*Bladder Symptoms.*—Since the sacral reflex arc is concerned in emptying of the bladder, its interruption by compression of the cauda equina usually causes

*retention of urine with overflow.* Even after a severe lesion of the cauda, reflex micturition is sometimes established later, the reflex being mediated through the vesical plexus.

*Anal Sphincter Relaxation.* See p. 225.

**Cauda Equina Lesion due to Massive Prolapsed Intervertebral Disk** is rare. The extruded disk material impinges upon, and compresses, the cauda equina causing *bilateral sciatica*, viz. —————→ The straight-leg-raising test is often positive at a low angle (but this may not be found if the extruded disk is lying free and not pressing on the emergent nerve-roots), the ankle-jerks are absent, there is weakness of the legs, but, above all, added to these signs there is hyperaesthesia of the saddle-shaped area referred to above. In many instances there is an abrupt onset of paralysis within a few days, in which event the condition is a surgical emergency.





## CHAPTER XVIII

### NON-ACUTE ABDOMINAL CONDITIONS

SINCE the first edition of this work the gradual and recently accelerating development of ancillary methods of investigation (particularly radiography) have enabled the clinician to diagnose non-acute abdominal disease at earlier stages. A careful history followed by efficient physical examination by the methods to be described will lead to an accurate tentative diagnosis in the majority of patients, but ancillary investigations will be required in almost all.

#### GENERAL PRINCIPLES IN THE EXAMINATION OF THE ABDOMEN

The patient should lie flat on the back. In passing, it is almost unbelievable how often a presumably intelligent person, when requested to lie on his back, will promptly roll on to his abdomen. As a rule, one pillow is sufficient, but always ascertain that the patient's head and neck are quite comfortable. Round-shouldered persons and those short of breath when lying flat or with cervical osteo-arthritis require more than one pillow. Have the abdomen bared completely and the blanket sufficiently low (*Fig. 426*) to display the inguinal and femoral rings. When a patient, particularly a young man, realizes that he is about to be examined, sometimes he arches his back and blows out his chest—no doubt to demonstrate his manly proportions. Tell the patient to relax and breathe through the mouth, and by trying to insinuate your hand between the couch and the patient, make certain that his back is resting comfortably upon the couch.



*Fig. 426.*—Before commencing the examination of the abdomen, ensure that the whole abdomen, including the inguinal and femoral rings, is exposed.

#### THE VALUE OF INSPECTION

**Inspection.**—A great deal of information can be gathered from inspection (*Figs. 427, 428*). In the demonstrations that follow, an endeavour will be made to bring out particular points that are revealed thereby. A common error is to skimp

this important part of abdominal examination. Look carefully for a visible swelling and for erythema due to hot-water bottle applications, the latter being evidence of fairly severe pain and of its location.

**Palpation.**—Continue in a calm, methodical frame of mind, and instead of placing the hand upon the abdomen unceremoniously, pay very careful attention to several preliminary details.

1. Routine palpation of the abdomen should be carried out with the flat of the hand. It is the flexor surfaces of the fingers, used collectively, that form the active palpating agent; the tips of the fingers take no part in the manœuvre. In order that the hand may impinge upon the abdomen at the correct angle, it is



Fig. 427.—By patiently watching the abdomen for about a minute...



Fig. 428... this swelling appeared, accompanied by visible peristalsis passing from left to right. Case of pyloric stenosis due to carcinoma.

essential for the forearm to be maintained in a strictly horizontal plane. As beds and couches vary in height, the examiner, if need be, must sit on a suitable chair or even kneel upon the floor, no matter how undignified this may appear (Emerson).

2. The great enemy of efficient palpation is muscular rigidity. The hands must be warm, at least as warm as the patient's skin, otherwise he will certainly contract his abdominal muscles. To wash your hands in hot water before the examination is an excellent expedient. Especially in cold weather, it is a good practice to commence palpating with a blanket or the patient's under-garment intervening between the abdomen and the hand. The patient's confidence is thus obtained, and, realizing that he is not going to be hurt, he tends to relax the abdominal muscles. Some clinicians, believing that better relaxation is obtained thereby, make it a rule to have the knees flexed, but unless a small pillow is placed beneath the knees the initial relaxation brought about in this way is counterbalanced by the strain of maintaining this position.

3. Ask the patient to breathe quietly and rather deeply through the mouth and keep the arms loosely by the sides. Request him to 'drop the jaw'—this ensures

that the mouth is open and it seems to help in obtaining general muscular relaxation. Tell the patient that he is not going to be hurt. Some relax better when they are engaged in conversation. Experience, and to some extent native wit, will reveal what manner of individual the clinician is palpating.

*Overcoming Rigidity in Refractory Cases.* In spite of ingenuity and subterfuge, the abdominal wall sometimes continues to remain unrelaxed. In such cases Nicholson's method is of considerable value. The base of the palm of the left hand is placed upon the lower part of the sternum and increasing pressure is

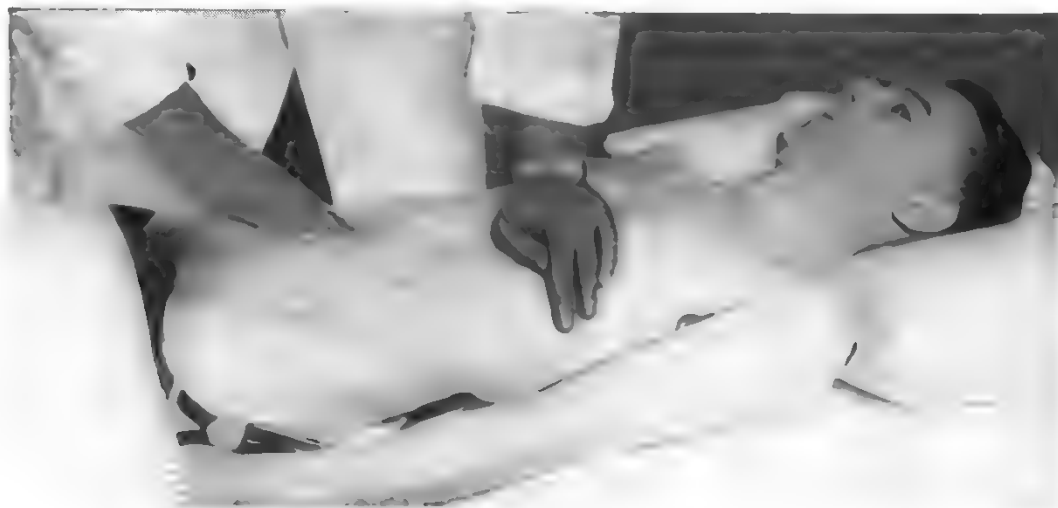


Fig. 429.—With the base of the left hand pressing upon the lower part of the sternum, thoracic respiration is impeded and the abdominal muscles relax.

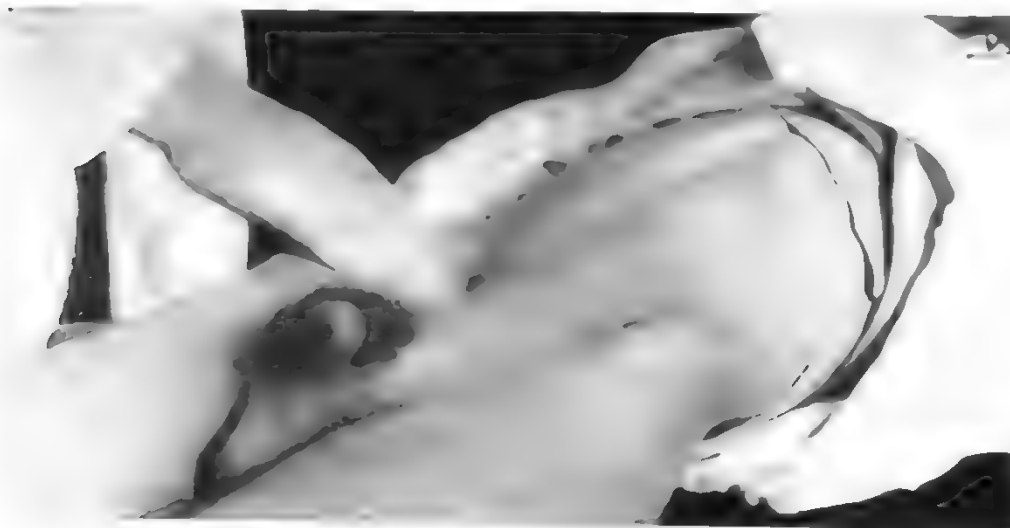


Fig. 430.—Deep palpation in the right iliac fossa.

exerted. Eventually the examiner is leaning quite heavily upon the chest, with the result that the patient breathes abdominally, while his thorax is comparatively still. When he draws in his breath his abdominal muscles necessarily relinquish their tonicity, whereupon the right hand seizes its awaited opportunity (Fig. 429).

To continue with examination of an average case when these exceptional expedients are unnecessary.—

**Technique of Routine Palpation.**—If pain is experienced in any particular part of the abdomen, begin by palpating the region diagonally opposite. For example,

if the pain is located in the right iliac fossa, commence palpating the left hypochondrium and work round, palpating each quadrant in turn, ending with the region of which the patient complains. During this manœuvre there should be co-operation between the hand and the mind. When the hand is over a particular region the mind should visualize the anatomical structures beneath, and while each quadrant is being palpated the examiner's eyes should be turned towards the patient's face, for if he winces when one area is palpated, and not another, obviously it is a sign of considerable diagnostic moment.

**Deep Palpation.** During the routine palpation of the abdomen just described no attempt is made to palpate deeply; this is reserved as a confirmatory measure in particular instances. The first essential is to overcome the resistance of the abdominal wall. Even a tense abdominal wall tends to relax during expiration or the pause between expiration and inspiration. Continuing palpation, advantage is taken of each period of relaxation for the forepart of the hand to sink progressively deeper and deeper into the abdomen. The position of the hand and fingers during deep palpation depends upon which viscus the clinician is attempting to palpate and at what distance that viscus is situated from the surface—usually the angle of inclination must vary with the thickness of the subcutaneous tissue. Deep palpation is not conducted with the flat of the hand, but rather with the flexor surfaces of the fingers with the hand tilted at a slight angle, viz. —————→

By gentle, even pressure, which becomes progressively deeper and deeper (*Fig. 430*), valuable information, unobtainable by any other method, is sometimes forthcoming. When an indefinite lump is present the technique shown in *Fig. 431* sometimes proves useful.



*Fig. 431.*—Using both hands, one superimposed upon the other, pressure is distributed evenly and the method is effective, particularly in deep palpation.

**Percussion** is of value in certain conditions, as indicated on p. 232.

**Auscultation** (*see pp. 309, 320*) is of occasional value (*see also Mesenteric Ischaemia, p. 234*).

#### EXAMINATION OF AN INTRA-ABDOMINAL SWELLING

**Inspection.** -If there is a visible lump, note particularly if it moves on respiration. In the endeavour to elucidate the nature of a lump in the abdomen, the first step is to exclude a swelling in the abdominal wall (*see p. 252*).

**Palpation.**—Note the consistency and shape of the lump; whether it is regular or irregular; mobile or fixed to the posterior abdominal wall. Further, note whether it moves on respiration. An examination in the knee-elbow position (Fig. 432) should be resorted to in obscure cases, and occasionally this is very helpful, particularly in deciding whether pulsations are transmitted from the abdominal aorta to an overlying swelling, or whether the swelling itself is pulsatile.



Fig. 432.—Examining the abdomen in the knee-elbow position.

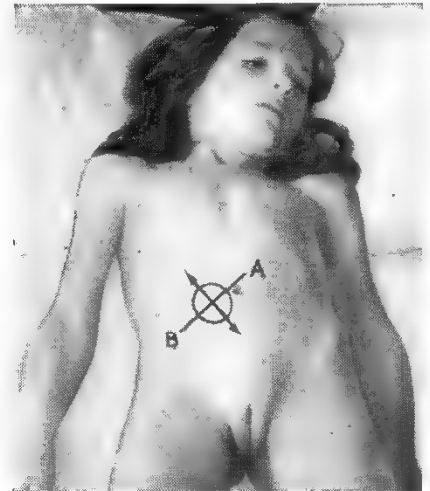


Fig. 433.—The sign of a mesenteric cyst. A-B represents the line of attachment to the mesentery. A mesenteric cyst moves much more freely in the direction of the arrows than in the plane at right-angles to it.

If the swelling arises from the pelvis, a bimanual rectal or vaginal examination (see pp. 288, 293) is essential. This is an excellent opportunity to set forth a simple, yet fundamental and unwavering rule: *Never express an opinion upon a tumour arising out of the pelvis until the bladder has been emptied by a catheter.*

There is one physical sign that occasionally proves helpful in obscure intra-abdominal swellings, and that is the *sign of a mesenteric cyst*. The lump moves in a plane from the right hypochondrium to the left iliac fossa, but not in the plane at right-angles to this (Fig. 433).

**Percussion.**—This will demonstrate whether the lump contains gas, i.e., is part of the gastro-intestinal tract or an abscess connected therewith.

In the demonstrations that follow, the physical signs of swellings connected with particular organs will be considered. So far as tumours are concerned, the abdomen is indeed a temple of surprise, and it is by our diagnostic humiliations when the abdomen is opened that we learn.

#### EXAMINATION OF A SUSPECTED GASTRIC OR DUODENAL CASE

While the history and a radiological examination following a barium meal are all-important in the diagnosis of a non-acute lesion of the stomach or duodenum, physical examination is indispensable, and sometimes yields invaluable information.

**Examine the Teeth**—particularly for evidence of pyorrhoea. Record the number of teeth present, particularly the molars. Are the latter sufficient to effect adequate mastication? If the patient has a dental plate, ask him whether he can



chew his food properly with it. In a surprising number of cases the patient replies that he removes his teeth when he eats!

**Pyloric Stenosis.**—If, from the history, there is any reason to believe that there is pyloric stenosis, particular attention should be directed to watching for visible peristalsis passing from left to right in the epigastrium (*see Figs. 428 and 434*).

*The Sign of Splashing* (Succussion Splash).—Splashing is of value only when the stomach, under normal conditions, would be empty—that is, *three hours after a meal*. The hand is laid over the stomach, and short, sudden, dipping movements are made. When the sign is positive it suggests incomplete emptying of the stomach due to pyloric obstruction.

*A Visible Lump.*—In the course of observing the epigastrium, occasionally a lump, almost invariably due to a carcinoma of the stomach, can be seen in the epigastric notch descending at each inspiration and disappearing during expiration.

*Palpation.*—In very thin individuals the normal pylorus sometimes can be felt but a barium meal X-ray is essential to confirm that the lump is not that of an early carcinoma which is usually painless on palpation and feels like a cotton-reel lying transversely. Note that the absence of a lump by no means excludes carcinoma of the stomach. A neoplasm of the stomach often possesses transmitted pulsation from the abdominal aorta, and usually it moves with respiration. The mobility of the lump is important when assessing the resectability of the neoplasm.



Fig. 434.—Visible peristalsis. A wave could be seen passing from left to right. Case of hypertrophic pyloric stenosis in an infant.



Fig. 435.—Palpating the pylorus of an infant for hypertrophy. The examiner is seated. *Inset:* radiograph in a doubtful case after feeding the infant with a dilute barium solution.

*Trousseau's Sign of Wandering Thrombophlebitis* (*see p. 403*).

**Carcinoma of the Stomach: Seeking Secondary Deposits.**—

*The Sign of Troisier* (*see p. 141*).

*Examine the Liver.*—The edge of the liver should be examined with great care for the presence of metastases. If the liver edge is irregular and/or the abdomen seems full, it is necessary to ascertain if there is ascites (*see p. 250*).

*Examine the Umbilicus* for a hard nodule (*see p. 257*).

*Rectal Examination.*—When carcinoma of the stomach is strongly suspected this is a *sine qua non* to exclude the presence of a transcoelomic implantation of metastases into the rectovesical pouch (rectal shelf of Blumer, *see p. 286*)

*Vaginal Examination.*—Bear in mind that Krukenberg's ovarian tumours are another manifestation of transcoelomic implantation of cancer cells.

**Suspected Pyloric Stenosis of Infants.**—The earliest sign of dehydration—lack of normal skin turgescence (*see* p. 46)—should be sought. Depression of the anterior fontanelle is in evidence only in advanced cases. This completed, proceed with the examination of the abdomen.

*Inspection.*—To observe an infant's abdomen for visible peristalsis, a good plan is to place it upon a table and arrange for it to be fed. More often than not it is necessary to watch for some time for waves of peristalsis (*Fig. 434*) which commence at the left costal margin, roll across the upper abdomen, to disappear beneath the medial border of the right rectus muscle. The most likely time for this phenomenon to appear is at the end of the feed, or some minutes afterwards.

Should the patient vomit (projectile vomiting is characteristic) the infant must be fed again while *the* sign of hypertrophic pyloric stenosis (the presence of a lump) is sought.

*Palpation.*—For this purpose it is best to employ the *left* hand to feel a hypertrophied pylorus and to have the baby sucking at the *left* breast (*Fig. 435*) or, if the baby is bottle-fed, resting on the mother's *left* arm. The stage is now set for palpating for a lump in the right hypochondrium. Employing this technique, the fingers rest upon the diminutive abdomen in such a way that with minimum adjustment the pulps of the index and middle fingers come to overlie the pylorus (*Fig. 435*). Palpation must be firm and deep, and it is better to maintain steady pressure than to make repeated digs. Usually it is necessary to exhibit patience and then, rather suddenly, the pylorus, which has been likened to an olive, is felt to harden beneath the fingers. If the lump is felt write in the patient's notes 'I have felt a lump'. If in doubt repeated examination is necessary. Only occasionally is an X-ray required to establish the diagnosis (*Fig. 435, inset*). With the administration of parenteral fluids there is no urgency with such cases. Where the symptoms point to pyloric obstruction, but no lump is felt, think of hiatus hernia—a possibility that at once becomes a probability if there is blood in the vomit.

**Suspected Duodenal or Gastric Ulcer or Hiatus Hernia.**—In a fair majority of patients with upper abdominal pain peptic ulcer, hiatus hernia, or gall-stones are the cause and in these clinical examination is usually unrewarding. *Fig. 436* shows the salient features for the location of pain and, in some instances, tenderness. Exceptions are frequent and X-ray investigation is mandatory.

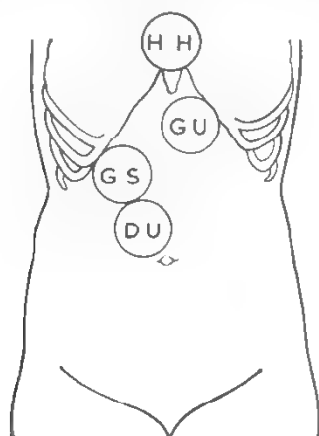
**Mesenteric Ischaemia.**—The history suggests a peptic ulcer but investigations are negative. If the patient is middle-aged or elderly remember that the origin of the superior mesenteric artery is prone to atherosclerosis and that the pain after meals may be due to a relative lack of oxygen in the small bowel when engaged in peristaltic activity ('abdominal angina'). The essential clinical clue is the presence of a systolic murmur on auscultation of the upper abdomen. Complete mesenteric vascular occlusion (*see* p. 317) often occurs at a later stage.

## EXAMINATION OF THE GALL-BLADDER

**Examination of a Case of Cholecystitis.**—The subjects of this disease are often fat, middle-aged, multiparous women, and this is so well known that it must be added that gall-stones are not uncommon even in thin men.

*The Detection of Jaundice* (*see* p. 235).—It is by no means necessary for the patient to be jaundiced in order to make the diagnosis of gall-stones. The presence

of deep, unmistakable jaundice associated with this condition means that a gall-stone is, or has been, obstructing the *common* bile-duct. On the other hand, slight transient jaundice can be accounted for by infection—for instance by cholangitis, which may be associated with inflammation of the gall-bladder.



*Fig. 436.*—Typical sites of pain with duodenal ulcer (DU) which comes on  $\frac{1}{2}$ –2 hours after food, gastric ulcer (GU) which occurs shortly after eating, gall-stones (GS), worse after fatty foods, and hiatus hernia (HH), worse on lying flat.

Observe the abdomen. Not infrequently a brownish stain is seen in the epigastrium and right hypochondrium. This is due to the application of heat, usually in the form of hot-water bottles, to relieve the pain. Ask the patient to show you where she experiences the pain. She will point to the right hypochondrium. Now ask where the pain goes to, and she will run her finger round the right abdomen, beginning in the left iliac fossa and ending in the right hypochondrium.

*Murphy's Sign (Moynihan's Method).*—Place the left hand on the costal margin in such a manner that the thumb lies over the fundus of the gall-bladder (*Fig. 437*)



*Fig. 437.*—Murphy's sign (Moynihan's method).



*Fig. 438.*—Boas's sign—an area of hyperaesthesia posteriorly.

and exerts moderate pressure. Ask the patient to take a deep breath. The sign is positive if the patient 'catches her breath' when the descending diaphragm causes

JOHN B. MURPHY, 1857–1916, *Surgeon, Mercy Hospital, Chicago.*

BERKELEY G. A., LORD MOYNIHAN OF LEEDS, 1865–1936, *Professor of Surgery, Leeds.*

the inflamed gall-bladder to impinge against the pressure of the thumb (temporary inhibition of respiration when inspiration is nearing its zenith).

*Boas's Sign.*—In cholecystitis there may be an area of hyperaesthesia (*see* p. 298) posteriorly. The tenderness extends from about 3 cm. lateral to the spines of the vertebrae to the posterior axillary line, and vertically from the level of the 11th dorsal to the 1st lumbar spine (*Fig. 438*).

**Differential Diagnosis between an Enlarged Gall-bladder and a Hydronephrosis.**—This question can be decided clinically (although radiological confirmation is desirable) by the method demonstrated in *Fig. 28*, p. 13; place the hands as shown and with the displacing hand exert *gentle* upward movements with the pulps of the fingers acting in harmony. If the swelling in question is a hydronephrosis, the watching hand will appreciate the upward lift imparted to the swelling. On the other hand, a large gall-bladder will be unaffected by those movements. The sign is entirely without value unless the movements are gentle.

### EXAMINATION OF A JAUNDICED ADOLESCENT OR ADULT

Jaundice is very liable to be overlooked in artificial light. Lesser degrees often can be discerned by a yellow tinge of the sclerae of the eyes before pigmentation is seen in the skin. Sometimes very slight yellow discoloration can be detected by examination of the posterior portion of the hard palate in daylight. When sufficiently deep to be observed in the skin, the abdomen will display it to advantage.

*Itching* often accompanies jaundice. The presence of scratch marks on the chest or abdomen sometimes gives a clue to the diagnosis when the patient is examined in artificial light or if the jaundice has faded. The itching, due to an accumulation of bile-salts in the blood, sometimes precedes jaundice.

**Virus Hepatitis** is the commonest cause of jaundice in the U.S.A. and Great Britain. Young patients are attacked more often than the middle-aged or elderly. As a rule, the condition commences abruptly with nausea, sometimes vomiting, general malaise, and mild pyrexia. Then, in about three days, the patient becomes jaundiced. The liver becomes palpable and tender. Occasionally the jaundice occurs in a more severe form, rendering the condition more difficult to differentiate from that due to one of the extrahepatic causes of biliary obstruction.

Virus hepatitis can follow blood transfusion or plasma infusion. *Syringe Jaundice* is another variety. The incubation period is remarkably long—60 to 135 days. If it can be proved that the syringe and the hollow needle used were not freshly boiled or autoclaved, legally the doctor in charge may be held responsible for having caused the virus infection. At the present time drug addicts are frequent sufferers.

When jaundice thought to be due to virus hepatitis does not clear within a reasonable period (say, a fortnight), the diagnosis should be reviewed.

**Jaundice consequent upon Gall-stones.**—When a patient gives a history of a recent attack of pain (within 48 hours) consistent with biliary colic and especially if previous attacks have occurred, jaundice due to gall-stones must be given first consideration.

Such jaundice can arise in two ways. In about half there is a stone or stones in the common bile-duct, and one of them is causing obstruction to the flow of bile into the duodenum. In the rest, it is due to concomitant infection of the intrahepatic bile-ducts (cholangitis).

The icteric tinge ranges from pale lemon (*Fig. 439*) to bright orange, and it *varies in intensity from day to day*. In cases due to impaction of a stone in the common bile-duct the jaundice, while varying in intensity, in the aggregate is likely to become darker, and occasionally it assumes a greenish hue. In such cases the

urine becomes correspondingly dark, while the stools become very light coloured, if not almost white (*see Fig. 37, p. 20*). At the commencement of an attack, tenderness in the right hypochondrium is likely to be present. As a rule, the gall-bladder is impalpable. Pyrexia occurs in one-third of cases. Usually the pyrexia is mild, although there may be one or two 'spikes' of elevated temperature in prolonged cases. All jaundiced patients tend to lose weight.

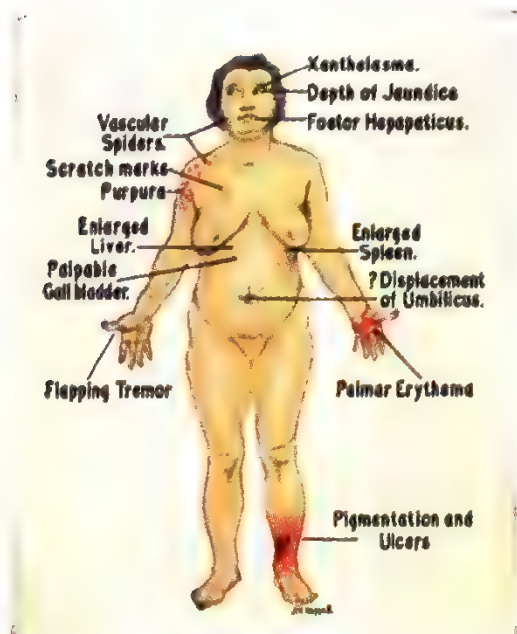


Fig. 439.—Physical signs for which to look in a jaundiced patient (*inspired by Sheila Sherlock*).



Fig. 440.—Profound jaundice. The outline of the enlarged gall-bladder has been marked out with a skin pencil. Case of carcinoma of head of pancreas.

**Oriental Cholangiohepatitis.**—In China, Japan, and Hong Kong cholangitis is commonly seen due to long-standing stones in the bile-ducts probably, but not certainly, associated with infestation by the Chinese liver fluke (*Clonorchis sinensis*) (Stocks). By the time the patient seeks relief, often the urine is the colour of a strong infusion of tea, secondary infection of the obstructed ducts has occurred, and the patients are frequently acutely ill and toxic. The gall-bladder is often palpable, because the stones are present only in the ducts (*see Courvoisier's Sign, p. 238*).

**Congenital Choledochus Cyst** is a rare condition affecting females four times more commonly than males. The symptoms and signs seldom appear before the age of 6 months, and in 50 per cent of cases are delayed until early adult life. There are attacks of jaundice, usually accompanied by upper abdominal pain and, if infection of the stagnant bile occurs, by pyrexia. In 90 per cent of cases a palpable cyst is present, the physical signs of which are identical with those of a pancreatic cyst (*see p. 244*).

**Hereditary Spherocytosis\*** (Acholuric† Familial Jaundice).—While occasionally the jaundice appears soon after birth or in very early life, more often its appearance is delayed until childhood, or even adult life. Once the disease has manifested itself, the patient suffers from periodic crises of red blood-cell destruction. Such crises are characterized by pyrexia, abdominal pain, nausea, vomiting, and extreme pallor. This is followed by jaundice, which varies in intensity, and at its height is a daffodil hue. There is often a family history. On examining the abdomen the spleen will be found to be enlarged, and in thin subjects it can be palpated with ease. A number of these patients have small pigment stones in the gall-bladder, and this fact should be borne in mind when

\* *Spherocytosis*. The red cells, instead of being biconcave, are biconvex. They are very fragile, and burst easily.

† *Acholuric* — without bile in the urine. In this condition the circulating bilirubin is insoluble in water, and is not filtered by the glomeruli.



summing up in cases where severe pain has to be accounted for. Chronic ulcers of the legs are a common occurrence in adult sufferers.

**Jaundice due to Carcinoma of the Head of the Pancreas.**—One characteristic feature should be noted especially—the jaundice so produced is steadily progressive. The icteric tinge becomes deeper and deeper until the skin and conjunctivae assume almost a mahogany hue (*Fig. 440*). The stools become putty-coloured, and continue to be practically uncoloured. In more than two-thirds of cases of carcinoma of the pancreas there is relentless, dull pain in the epigastrium, which precedes the jaundice and continues week in, week out. In less than one-third of cases the growth commences in, or very near, the ampulla of Vater, in which event the onset of jaundice is painless, or almost so. Occasionally with this variety, necrosis of portions of the growth occurs, pent-up bile escapes into the duodenum, and variations in the depth of jaundice, together with pyrexia, mimic the waxing and waning that characterize the jaundice of calculus obstruction of the common bile-duct.

**Courvoisier's Sign.**—If in a jaundiced patient the gall-bladder is enlarged, it is *not* a case of stone impacted in the common bile-duct, for previous cholecystitis, which existed when the stone was in the gall-bladder, must have rendered the gall-bladder fibrotic and incapable of dilatation. There are many exceptions to this sign (apart from the fact that in a fat patient the enlarged gall-bladder may be impalpable), the most notable of which are: double impaction, when there is one stone in the cystic and another in the common bile-duct, and Oriental cholangio-hepatitis (*see p. 237*).

### JAUNDICE IN INFANCY

**Icterus Neonatorum.**—Between the second and the fifth days of life about 1 in 6 of all newly born infants develop jaundice which reaches its zenith in three or four days, and then fades gradually. The liver is not enlarged, neither are the stools clay-coloured nor the urine deeply bile-stained. This so-called 'physiological' jaundice is deepest and most prolonged in premature infants.

**Erythroblastosis Foetalis** (*Icterus Gravis Neonatorum*). The baby is *born* jaundiced, the condition being brought about by a Rh-positive foetus in the uterus of a Rh-negative mother. At the present time the diagnosis can be made during pregnancy by testing the mother's serum for antibodies, and so arrangements can be made for exchange transfusion of the affected infant soon after delivery. Unless remedied early, the jaundiced infant may die suddenly of kernicterus.\*

**Congenital Atresia of the Bile-ducts.**—Sometimes a slight icteric tinge is present at birth. More usually the jaundice does not appear for two or three days. Occasionally it is delayed for one or more weeks. Unless the atresia can be remedied, the jaundice becomes deeper and deeper (*Fig. 441*), the urine more and more bile-stained, and even the tears and saliva are yellow. From birth the stools are almost white, but after two weeks they may become faintly yellow. This does not necessarily signify that the atresia is incomplete, because in profound jaundice a small amount of bile-pigments is excreted by the intestines. Gradually the liver becomes larger and larger, and on palpation feels unduly hard. Nutrition is well maintained, especially if the baby is given feeds containing but little fat. Unrelieved, death results, but the child may survive for a surprising length of time (up to six years—*Sherlock*).

**Omphalitis.**—Infection of the umbilicus is liable to give rise to spreading infection along the

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\* *Kernicterus* = fixation of bile-pigments in the basal ganglia of the brain.

incompletely obliterated umbilical vein, and occasionally hepatitis, resulting in jaundice, supervenes. Severe infection elsewhere is also liable to produce jaundice.

**Spherocytosis (Acholuric Familial Jaundice).**—In comparatively rare instances of this disease (*see* p. 237) the baby is born jaundiced, and the spleen is obviously enlarged. Ask the mother if she or any of her family have had the spleen removed, or if any of them have suffered from jaundice.



*Fig. 441.*—Congenital atresia of the common bile-duct.

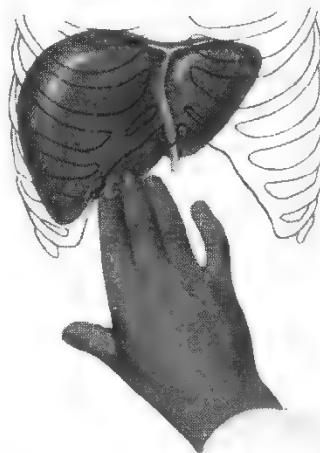
### EXAMINATION OF THE LIVER

During infancy until about the end of the third year the normal liver extends one to two finger-breadths below the costal margin (*Fig. 442*). During inspiration, at this period of life, the extreme edge of the normal spleen is also palpable (Capon).

In healthy thin adults occasionally the edge of the liver can be felt a finger-



*Fig. 442.*—During infancy the edge of the normal liver can be palpated: it is also possible to feel the edge of the normal spleen during inspiration.



*Fig. 443.*—Occasionally the free edge of the normal adult liver can be felt to override the fingers during inspiration.

breadth below the costal margin (*Fig. 443*). As a rule, however, and especially when the patient is well covered, the normal liver is impalpable. Consider now the enlarged liver. Inspection is not of great value, although, on occasions, the edge of a large liver can be seen to move downwards on inspiration. Reliance, therefore, must be placed on palpation. With a thin patient who relaxes easily there is no

difficulty in detecting an enlarged liver. If in doubt or when a well-developed right rectus muscle hinders palpation, proceed in the following roundabout manner.

**Palpating an Enlarged Liver.**—Lay the hand on the right iliac fossa with the fingers pointing towards the left axilla. Every time the patient expires, slide the hand a little nearer the right costal margin (Osler). Progressing in this way, a time is reached when the edge of an enlarged liver strikes the hand as the patient inspires.



*Fig. 444.*—Examining the free edge of an enlarged liver. The fingers have just overridden the liver edge, which can be seen. In this case of secondary carcinoma the free edge felt irregular and was stony hard.



*Fig. 445.*—Gross enlargement of the liver and a glass eye (which has been worn for, maybe, many years) is practically pathognomonic of secondary melanoma, the primary growth having been in the uveal tract.

In this event, keeping the hands stationary, ask the patient to take a deep breath, and while inspiration is in progress the finger-tips will be felt to ride over the free edge of the liver (*Fig. 444*).

At the moment of impact of the fingers with the liver edge the character of the organ is noted. Once the liver edge has been felt distinctly, working from right



*Fig. 446.*—Secondary carcinoma of the liver with a large bosselation in the region of the gall-bladder. Typically each metastasis is umbilicated.

to left, the lower border of the liver is defined as far as possible and outlined with a skin pencil.

Attention is directed now to the upper surface of the organ. Commencing in the right mid-axillary line at about the fourth interspace, percuss and obtain a clear resonant note. Then work downwards until the resonance is supplanted by

dullness. Here mark the upper border of the liver. The anterior and posterior thoracic walls are examined in the same manner. It should be noted that a hydatid cyst and an amoebic abscess of the liver often cause hepatic enlargement in an upward, rather than in a downward, direction.

**Secondary Carcinoma of the Liver** (Figs. 445, 446).—Jaundice with stony-hard irregular enlargement of the liver edge nearly always signifies secondary carcinoma in the liver. Ascites (see p. 250) of a lesser or greater degree is often apparent.

**Primary Carcinoma of the Liver** is extremely common in some parts of the world, notably in many parts of Africa and in Malaya and Hawaii. The findings are as noted in the paragraph above, although occasionally one can appreciate that there is a single large swelling in the liver with surrounding secondaries.

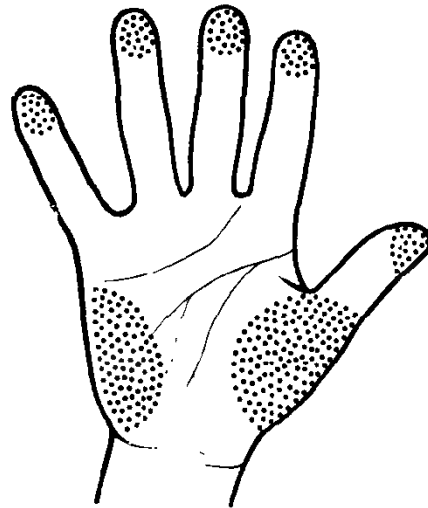
**Hepatic Cirrhosis** (Laennec's cirrhosis\*).—Usually the patient is middle-aged and frequently (particularly in the U.S.A.), but not necessarily, alcoholic. The liver is firmly and evenly enlarged. Nodularity of the organ may be apparent in a thin patient. Only exceptionally, in the atrophic type, is there no enlargement. Palpable enlargement of the spleen (see p. 242) is strong evidence that haematemesis is due to portal hypertension consequent on cirrhosis and not to a peptic ulcer. Lack of body hair is often a noticeable feature in a patient with established portal hypertension. Haematemesis due to this cause is found in the following categories (Hunt):—

**MILD CIRRHOSIS** is quiet and of long duration. In some cases there are repeated attacks of slight jaundice with epigastric pain and vomiting. The stigmata mentioned below are absent.

**MODERATE CIRRHOSIS**.—The spleen usually increases in size *pari passu* with the rising portal hypertension. If they have not been noticed on the face (a common situation) while taking the patient's history, look for:—

**Spider naevi** (see Fig. 176, p. 89) not only on the face, but on the neck, shoulders, and upper arms (territory of the superior vena cava). Spider naevi consist of

Fig. 447.—Typical distribution of palmar erythema, namely over the eminences and the pulps of the fingers.



branching arterioles which, with a magnifying glass, can be seen to pulsate. Also examine the hands for:—

**Palmar erythema**, which is less commonly encountered than the foregoing,

\* *Cirrhosis*. Laennec introduced the term from the Greek *κίρρος* = tawny, as the nodules are orange-yellow in colour.

and, when present, is very characteristic. The hands feel warmer than usual, and the palms are bright red, especially in the areas depicted in *Fig. 447*. By contrast, the finger-nails are deathly white.

**SEVERE CIRRHOSIS.**—The patient is jaundiced and ill. Look for dilated superficial veins issuing from the umbilicus. These are numerous, and radiate in many directions, forming a *caput medusae* (*see p. 17*). In the male, examine the testes. Due to inability of the failing liver to neutralize circulating oestrogens, the testes atrophy. For the same reason, occasionally, gynaecomazia (*see p. 181*) supervenes. Ascites (*see p. 250*) will be found.

**Liver Insufficiency—Hepatic Coma.**—When the liver cells are so damaged as to render them incapable of synthesizing ammonia into relatively harmless urea and uric acid, signs of liver insufficiency develop. The high absorption of protein nitrogen, such as is occasioned by a large amount of blood in the intestinal tract following haemorrhage from oesophageal varices, often precipitates insufficiency, which may also arise simply from replacement of liver cells by fibrosis. Foetor hepaticus, a sweetish, musty odour, is noticeable. Soon there is ataxia, and a flapping tremor of the outstretched hands, so coarse that it can be likened to the beating of the wings of a hovering hawk waiting to pounce. Rigidity of the limbs is usual, and ankle clonus can be elicited as the encephalopathy advances. This stage of excitability lasts a varying time, and unless, by treatment, the absorption of excessive amounts of protein nitrogen can be reduced and noxious by-products neutralized, stupor, followed by coma, supervenes. Frequently repeated convulsions herald early death. Ten per cent of patients who have undergone portacaval anastomosis for portal hypertension suffer from episodic stupor and confusion at some stage of their postoperative course. The ingestion of a large meal of meat is liable to precipitate such an attack.



*Fig. 448.*—Massive enlargement of the spleen. Case of portal hypertension. Splenic notch easily palpable. The patient was admitted with haematemesis.

#### EXAMINATION OF THE SPLEEN

This is not the place for a discussion on the differential diagnosis of the enlarged spleen. Methods of detecting splenomegaly will be detailed. If an enlargement is found, the stigmata of hepatic cirrhosis (*see p. 241*) should be sought, also lymphadenopathy in the neck, axillae, groins, and epitrochlear regions indicating a reticulosis.

**An Enlarged Spleen as an Intra-abdominal Swelling.**—An enlarged spleen moves freely with respiration, and has a sharp anterior edge which is always directed



downwards and inwards. Often this edge is notched (*Fig. 448*), but not necessarily so. A splenic tumour is dull to percussion, and this dullness is continuous with the normal splenic dullness, which may also be increased upwards.

The usual difficulty in differential diagnosis is between an enlarged spleen and an enlarged left kidney. In the case of the spleen there is always a small space between the posterior edge of the organ and the sacrospinalis muscle.

**Palpation for Minor Enlargement.**—The left hand is placed over the lateral aspect of the costal margin, and, whilst exerting a certain amount of even compression, at the same time it draws the skin and subcutaneous tissues downwards and forwards over the ribs towards the expectant fingers of the right hand. This leaves a loose fold of skin under the costal margin. The right hand lies on the abdominal wall just below the margin of the ribs, with the finger-tips pointing towards the



*Fig. 449.*—Bimanual palpation of the spleen.



*Fig. 450.*—Palpating the spleen from above.

spleen (*Fig. 449*). Keep the hands still, and do not expect to feel anything abnormal until near the end of inspiration. Just before the zenith of inspiration, draw the hands slightly together and dip a mere trifle with the right finger-tips. If the spleen is palpable the finger-tips will be felt to ride momentarily over its edge. The spleen must be one and a half times larger than normal before it can be detected by clinical methods\* (*Blackburn*).

The most potent cause of failure to detect an enlarged spleen is that the organ is sought more superomedially than it should be. In other words, the spleen lies more laterally than we are inclined to think when visualizing the position of the organ.

*Method of Palpating the Spleen from Above* can be employed when the foregoing routine method is unsuccessful. A pillow is placed beneath the knees. The patient's left fist under the lower ribs pushes the spleen forward (*Middleton*). The clinician stands on the left side of the patient's head and places the fingers of both hands over the left costal margin (*Fig. 450*). The patient is instructed to take a deep breath, and if the edge of the spleen is not felt during

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\* Traditionally it was taught that the spleen must enlarge 2–3 times before it becomes palpable. *Blackburn* has refuted this with radiological studies of experimentally induced malaria in volunteers. Moreover *McIntyre* has shown that in college freshmen the normal spleen was palpable in 3 per cent and remained palpable for 3 years in a third of these.

expiration, the hands are moved farther downwards and laterally, and the process is repeated. If after all these attempts to feel the organ the edge of the spleen cannot be felt to ride over the fingers, it can be concluded safely that the spleen is not clinically enlarged.

**Kenawy's Sign** is found relatively frequently with the splenomegaly associated with bilharzial cirrhosis of the liver (Egyptian splenomegaly) but may be present in any type of portal hypertension. Auscultation, the stethoscope being applied beneath the xiphoid process, reveals a venous hum louder on inspiration. The phenomenon is probably due to engorgement of the splenic vein, and the hum is louder during inspiration because the spleen is then compressed.

## THE PANCREAS

The oesophagus, thymus, and the adrenals excepted, no organ of the body is so completely inaccessible to physical examination as the pancreas; therefore, nearly all of its diseases must be suspected by an indirect approach.

**Fibrocystic Disease of the Pancreas** is but one manifestation of a congenital disease that renders the mucus of all mucus-secreting glands very viscid (*mucoviscidosis*). Viscid mucus obstructs the pancreatic ducts, giving rise to steatorrhoea (*see* p. 21) with bulky, most obnoxious stools. Viscid mucus also obstructs the bronchioles, and results in respiratory difficulty, bronchiectasis, and possibly pectus excavatum (*see* p. 183). The sweat-glands excrete sweat containing much more sodium chloride than normal. Thus, in hot weather, as a consequence of excessive electrolyte loss, dehydration is likely to supervene. Patients with fibrocystic disease of the pancreas, if they survive infancy (a rarity), not infrequently develop portal hypertension.

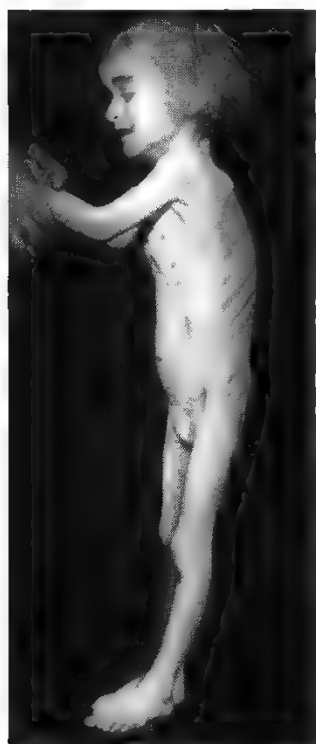


Fig. 451.—Fibrocystic disease of the pancreas in a child aged 2 years.

If an infant or child, in spite of a voracious appetite, wastes (*Fig. 451*), has a chronic cough, and passes bulky and most offensive-smelling stools, think of fibrocystic disease of the pancreas. Confirmation of the diagnosis rests in chemical examination of the sweat for excessive sodium chloride content.

**Chronic Relapsing Pancreatitis** is a relentless, progressive disease characterized by:—

*Attacks of Pain* almost identical with that of biliary colic, but instead of lasting minutes, the attacks last three to four days. So intolerable does the pain become that 50 per cent of the patients so afflicted become alcoholics or drug addicts; conversely, chronic pancreatitis favours those who imbibe too freely. Many of the patients have had their gall-bladder removed without benefit.

*Mallet-Guy's Sign.*—With the patient lying on the right side in the knee-chest position palpation of the left sub-costal region may evoke tenderness not otherwise found (*Fig. 452*). The explanation is that the overlying organs fall to the right in this position, exposing the body and tail of the pancreas to direct palpation.

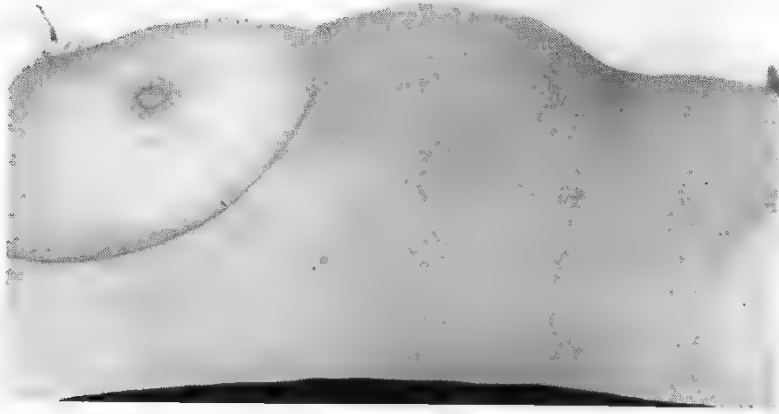
Jaundice supervenes in only 15 per cent of cases (Cattell) but diabetes is present in 30 per cent. Steatorrhoea (*see* p. 21) should be looked for, but it is late in appearing. Loss of weight is sometimes alarming.

*Pancreatic Ascites.*—In a small minority of cases pancreatic fluid escapes from the duct system to cause clinical ascites (*see* p. 210). The essential clue is that the ascitic fluid contains a high level of amylase (*see* p. 307).

**Pancreatic Cyst** is not uncommon in chronic pancreatitis. Here is a condition of the pancreas with objective signs. A pancreatic cyst usually gives rise to a swelling

above the umbilicus, best seen when viewed laterally (*Fig. 453*). The cyst is round, smooth, and usually tense. It is almost always immovable. A pseudo-pancreatic cyst is a collection of fluid in the lesser sac, that not infrequently follows an attack of acute pancreatitis.

*Fig. 452.*—Mallet-Guy's sign—tenderness over the tail and body of the pancreas in the right knee-chest position.



*Fig. 453.*—The swelling of a pancreatic cyst viewed from the side.

**Carcinoma of the Pancreas.**—In an early case of carcinoma commencing in any part of the pancreas, those who rely mainly on radiographic and laboratory investigations to provide the diagnosis will go unrewarded. The symptoms, the physical signs (meagre as they may be), and, above all, awareness of the possibility of this affliction are the only stanchions upon which the diagnosis rests. The principal value of scientific methods is to rule out other possibilities.

**Carcinoma of the Head of the Pancreas** has been considered already under the heading of Jaundice, p. 238.

**Carcinoma of the Body or Tail of the Pancreas** is exceedingly difficult to diagnose early because of the absence of jaundice. Severe or almost intolerable epigastric pain is the principal symptom.

*An Epigastric Mass* (not the liver) is palpable in one out of three patients with carcinoma of the body of the pancreas.

*Anaemia* is not so much in evidence as in cases of carcinoma of the stomach.

*Thrombophlebitis Migrans* of the lower extremities (Trousseau's sign of wandering thrombophlebitis, see p. 403) is often the first striking sign of carcinoma of any part of the pancreas.

*Diabetes* is occasionally the first sign. The condition should be suspected when an elderly

person develops diabetes and, in spite of adequate treatment, continues to lose weight (Lawrence). The pancreas is the most common site for malignant disease in diabetics.

**Functioning Islet-cell Tumour of the Pancreas.**—This rare tumour is never large enough to be palpated. It secretes excess insulin causing attacks of hypoglycaemia which occur at irregular intervals, becoming more frequent and more severe. Each fully fledged attack can exhibit four phases—in the beginning the attacks do not necessarily progress beyond the first or second phase.

*Phase 1.*—Often the symptoms simulate a duodenal ulcer, awakening the patient in the early hours of the morning with vague abdominal discomfort and a feeling of being unwell.

*Phase 2.*—In the early morning or before luncheon there is a sudden feeling of great hunger, followed quickly by trembling, sweating, dizziness, and blurring of vision.

*Phase 3.*—Sluggish mind, inarticulate speech, incoordinated movements, diplopia, and symptoms of hallucinations.

*Phase 4.*—Fits indistinguishable from epilepsy, passing into semiconsciousness or coma, with dilated pupils and muscular spasticity, sometimes amounting to decerebrate rigidity. Sometimes the fits are unilateral, and mislead the clinician into believing that they are due to an organic intracranial lesion such as a subdural haematoma.

Diagnosis rests on the finding of a very low blood-sugar level *during an attack*.

### SUSPECTED RECURRENT OR CHRONIC APPENDICITIS AND THE DIFFERENTIAL DIAGNOSIS THEREOF

The methods of examination to be employed differ very little from those dealt with fully in the early pages of this chapter. Deep tenderness at or near McBurney's point (*see Fig. 553, p. 298*) is the only positive physical sign.

The diagnosis is largely one of exclusion. Constipation, particularly in young females, is a common cause of lower abdominal pain. All patients should thus be questioned regarding their bowel habit. Rectal examination may reveal a loaded bowel, even in persons who state that they have a daily bowel action.

Secondly, a history of scalding on micturition, or of pain reminiscent of ureteric colic (*see p. 349*), should suggest to the clinician that radiographic investigation of the urinary tract is essential.

The third relatively common cause of chronic pain in the right iliac fossa is a tubo-ovarian abscess (*see p. 327*). Less common causes are as follows:—

**Amoebic Typhlitis.\***—When confronted with a patient who has resided in the tropics and has signs of recurrent inflammation in the right iliac fossa, consider the possibility of chronic amoebic colitis. In amoebic typhlitis there are *two* characteristic localized zones of tenderness, one over McBurney's point and one over an exactly comparable point in the left iliac fossa. The latter has been named aptly by Manson-Bahr 'the amoebic point'.

**Tuberculous Mesenteric Lymphadenitis.**—The patient is usually, but not necessarily, a child. The pain is usually central, not severe, and almost constant. The abdomen is somewhat protuberant and there is tenderness on deep pressure in the right iliac fossa. Occasionally, on deep palpation, enlarged mesenteric lymph-nodes are discernible as firm, discrete, tender, bean-like objects most frequently to the right of, and near, the umbilicus. If these signs are in evidence the clinician's duty is to order radiographs of the chest and to perform a skin-test for tuberculosis.

**Crohn's Disease (Regional Ileitis)** is independent of age, sex, social and economic conditions, or geographical location. In contradistinction to any of the foregoing, there is a history of mild diarrhoea extending over months or years, occurring continuously, or in bouts accompanied by intestinal colic, which is relieved by defaecation. As a rule, a tender mass can be felt in the right iliac fossa, and frequently by pelvic examination also. There is a high incidence of anal lesions (fissure, fistula, ulcer) accompanying Crohn's disease, particularly when the colon is involved. *See also the Acute Manifestations of Regional Ileitis, p. 318.*

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\* *Typhlitis* = inflammation of the caecum.

ROBERT D. LAWRENCE, 1892–1968 *Physician, King's College Hospital, London.*

SIR PHILIP MANSON-BAHR, 1881–1966, *Physician to the Hospital for Tropical Diseases, London.*

BURRILL B. CROHN, *Contemporary Professor Emeritus (Medicine), Mount Sinai Hospital, New York, first described this disease in 1932.*

## EXAMINATION OF A COLONIC CASE

A history of diarrhoea or alternating constipation and diarrhoea strongly suggests that the large intestine is diseased. Blood and/or mucus (slime) in the stools is a most suggestive point. Needless to say, digital examination of the rectum is essential.

**Examination of a Case of Chronic Constipation; Suspected Chronic Intestinal Obstruction.**—Time spent in inspecting the abdomen is seldom wasted; in this instance it frequently brings a rich reward. In most cases of carcinoma of the colon with early (chronic) obstruction, there is a slight fullness in the right iliac fossa only apparent when looked for especially.

Arrange the patient on the examination couch carefully, so that one anterior superior iliac spine is not higher than the other, and an imaginary line through them is precisely at right-angles to the long axis of the examining couch (*Fig. 454*) ensuring that the patient is lying quite 'square' and is comfortable and relaxed.

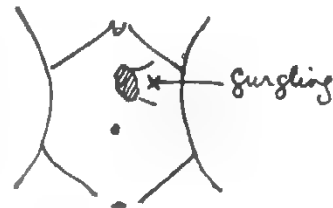


*Fig. 454.*—Inspection of the abdomen in general, and for a fullness in the right iliac fossa in particular, is best undertaken in the manner shown above. It is important to see that the patient is lying quite 'square'. The imaginary line drawn through the iliac spines should be at right-angles to the edge of the examining couch.

Observe the abdomen intently. Compare the left with the right iliac fossa. A fullness of the right fossa due to a distended caecum is better seen than felt. The caecum is distended in most cases of obstruction to the large intestine (*see p. 310*). When there is even the slightest fullness in the right iliac fossa percuss the area. If a resonant note is obtained, the suspicion of a distended caecum is strengthened. Commence palpation in the right iliac fossa. If on deep palpation gurgling is heard, the suspicion is also strengthened.

Palpate each of the remaining quadrants of the abdomen systematically.

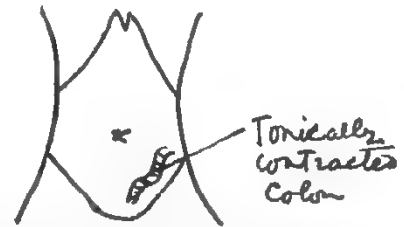
When a lump in the line of the transverse colon inclining to the left of the middle line presents, the question arises: —————→ 'Is this a growth of the stomach, or is it a carcinoma of the colon?' If gurgling can be elicited on the left side of the lump assuredly the pyloric end of the stomach is obstructed (*see the Sign of Splashing, p. 233*).





When a lump is detected in the line of the large intestine, frequently it is necessary to eliminate the possibility of a faecal mass. This can be indented by digital pressure if large enough. If in doubt, re-examine the patient after a bowel wash-out. If the mass has disappeared it must have been faecal.

Especially in thin patients, the normal pelvic colon can often be rolled beneath the fingers—a state that gives a characteristic sensation to the examining fingers.



**Chronic Colonic Diverticulitis.**—The patient is often over the age of 60 years. The history is one of exacerbations and remissions; the exacerbations last a few days to more than a week, and the remissions for months or even years. Pain situated in the left iliac fossa is the typical complaint; it becomes worse on defaecation or on being jolted, as when riding in a vehicle. Periodic loose stools with the passage of some mucus are rather common during the attack.

Frequently the patient is obese. Palpation of the abdomen reveals tenderness in the left iliac fossa. Sometimes a thickened, tender, pelvic colon can be palpated in the left iliac fossa or on bimanual examination. When the patient is obese, deep tenderness in the left iliac fossa is the only physical sign that can be elicited.

**Haemorrhage per Rectum.**—At least 20 per cent of patients with colonic diverticulitis pass blood per rectum and severe rectal bleeding is more common with diverticulitis than with a colonic or rectal neoplasm.

**Suspected Ulcerative Colitis.**—The onset is in the third, fourth, and second decade, in that order. Occasionally, it is encountered in childhood. The first symptom is watery diarrhoea occurring in a person of previously normal bowel habit.



Fig. 455.—Hirschsprung's disease, a very extreme neglected example.

Mucus (sometimes blood-stained) is present in the stools (see Fig. 41, p. 20). The disease progresses by relapses and remissions. In untreated cases of some standing the patient becomes wasted, and severely anaemic from loss of blood. Often during the attacks there are 10 to 20 stools a day, accompanied by tenesmus. The frequency of the motions and the degree of invalidism go hand in hand, and are usually proportional to the extent of the involvement of the colon. When the whole colon is involved often the patient cannot work, and in an extreme case is so weak as to be partially or wholly bed-ridden. The only sign on abdominal examination is deep tenderness over the portion of the colon that is involved and this is by no means invariably present. Digital examination of the rectum is comparatively uninformative; the rectum is empty, may be ballooned, and if it is implicated, it is tender and may impart a sensation of heat to the examining finger. Sigmoidoscopy and radiography are indispensable in confirming the diagnosis.

**Congenital Megacolon (Hirschsprung's Disease)** is more common in the male (4:1). In 90 per cent of cases the signs appear within three days of birth; only in 1

per cent of cases are they delayed until past the patient's first birthday. The infant fails to pass meconium during the first two or three days, and then only after the insertion of a little finger or a tube into the rectum. Subsequent motions are sometimes characteristic (*see* p. 21). As a rule, by the third day abdominal distension is unmistakable, and loud borborygmi and visible peristalsis are much in evidence. In a proportion of cases, as the abdominal distension progresses, the distended flanks proclaim that the obstruction is of the large intestine (*Fig. 455*). In others the distension is indistinguishable from that occurring in partial obstruction of the lower ileum.

**Rectal Examination.**—The anus is normal but the rectum is empty and contracted; depending on the length of the aganglionic segment, the finger may enter dilated bowel above the neurogenic obstruction. The findings are illustrated in *Fig. 542*, p. 290. Usually after the withdrawal of the finger, flatus and, in neonates, meconium are passed.

**Acquired Megacolon.**—The symptoms arise, not soon after birth, but when the child is older. In a few cases, on inspection of the anus an anal fissure (*see* p. 280) is found to be present. In every instance, on rectal examination the finger encounters a scyballous mass, which is contrary to what is found in Hirschsprung's disease.

**Megacolon in Chagas' Disease.**—Although acquired, in this tropical disease, the dilated bowel is due to the same cause as Hirschsprung's disease (absence of parasympathetic ganglion cells). The findings on rectal examination are thus the same as in the congenital variety but the condition is found at any age. *See* footnote on p. 202.

### ASCITES

A general fullness of the abdomen may be due to: *Fat, Fluid; Flatus; Faeces; or Foetus.*

The latter, in the aggregate, is easily the commonest, but the patient usually supplies the diagnosis. Occasionally a woman near the menopause, or a mental defective, is unaware that she is pregnant. For varying reasons a woman may wish to conceal a pregnancy, so it is as well to cultivate a suspicious mind.



*Fig. 456.*—Testing for a 'fluid thrill' (case of tuberculous peritonitis).

**Fluid Thrill.**—The orthodox method of testing for ascites is shown in *Fig. 456*. An assistant places the edge of his hand firmly on the centre of the abdomen in

order to damp down a fat thrill. The abdominal wall on one side is flicked, and the thrill is felt by the hand on the other side of the abdomen.

**Shifting Dullness** is a valuable sign when the quantity of fluid in the peritoneal cavity is comparatively small. Ask the patient to turn somewhat on to his left side. Wait for a minute in order to allow the fluid to gravitate. Commence percussion from the right side to the left, noting where the resonant area becomes dull and marking the spot on the abdominal wall. Then the patient is asked to turn slightly on to his right side, and after a reasonable interval, if shifting dullness is present, the dull area will have become resonant, and vice versa (*Fig. 457*). Remember that dilated coils of small intestine can also behave in this way in intestinal obstruction.



*Fig. 457.*—Shifting dullness. The sign of free fluid in the peritoneal cavity.

**'Dipping'.** A special technique is required to palpate organs or tumours in cases of ascites. This is known as 'dipping'. The pads of the fingers are placed on the abdomen, and then, by a quick push, the abdominal wall is depressed. By this method an enlarged liver is felt easily, and a tumour mass can usually be defined.

Having settled that ascites is present, unless the cause is known already, the clinician must set about elucidating it. In surgical practice the most common causes are carcinomatosis peritonei, portal hypertension, and tuberculosis peritonitis, but the overall commonest cause is congestive heart failure. In the last, engorgement of the veins of the neck is very often in evidence (*see p. 17*).

Still referring to cases where the cause of ascites is obscure, vaginal and/or rectal examination is most necessary. A pelvic neoplasm and occasionally tuberculous salpingitis may be discovered.

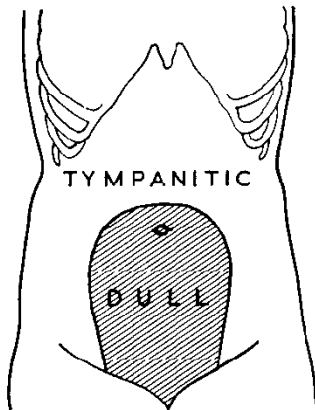


Fig. 458

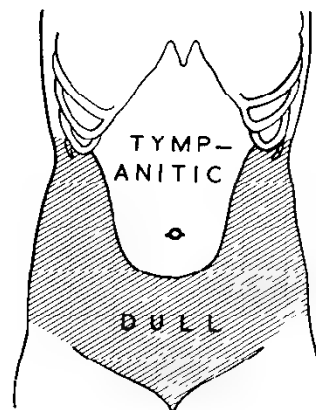
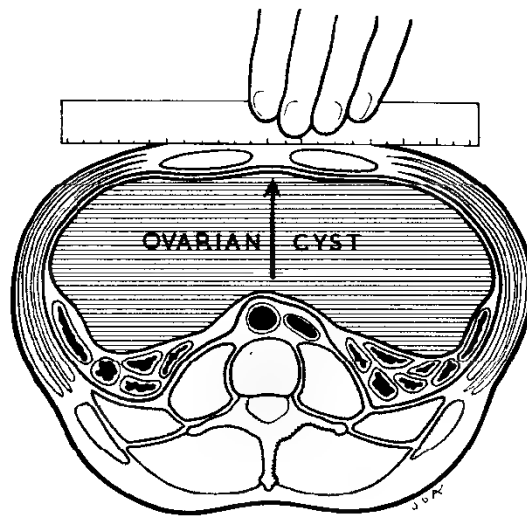


Fig. 459

Figs. 458, 459.—Differential diagnosis between ovarian cyst (Fig. 458) and ascites (Fig. 459).

Fig. 460.—Differential diagnosis between ascites and an ovarian cyst filling the abdomen. A flat ruler is laid on the abdomen just above the anterior superior iliac spines and pressed firmly backwards. If the swelling is due to a cyst, the pulsations of the aorta are transmitted to the fingers and can be demonstrated by the ruler.



**Differential Diagnosis between an Extremely Large Ovarian Cyst and Ascites.**—After the bladder has been emptied by a catheter, the problem can be elucidated easily by percussion (Figs. 458, 459). When the whole abdomen is filled by a cystic swelling, a rarity, this differential diagnosis becomes exceedingly difficult unless the method shown in Fig. 460 is applied. This phenomenon is not present in ascites (Blaxland).

## CHAPTER XIX

## THE ABDOMINAL WALL, UMBILICUS, AND GROIN

## THE ABDOMINAL WALL

IN the endeavour to elucidate the nature of a lump in the abdomen, the first step is to exclude a swelling in the abdominal wall. A good method of rendering the abdominal wall tense is:—

*Carnett's Test.*—The patient, who should be lying flat with no pillow, is asked to extend both legs, and while keeping his knees stiff, to raise his feet from the bed.

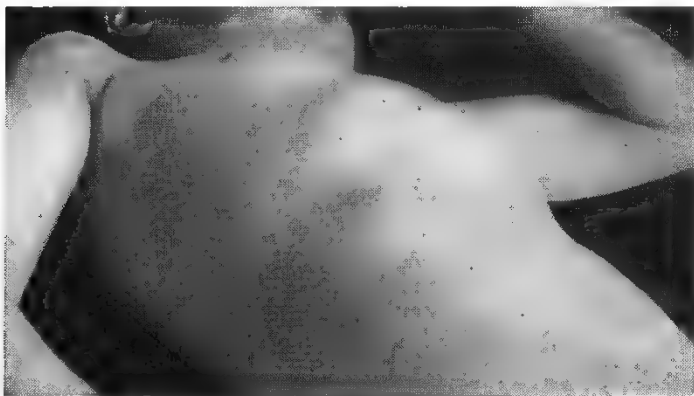


Fig. 461.—A lump in the abdominal wall which proved to be a cold abscess.

This procedure renders the abdominal muscles tense. If the lump is intraperitoneal it disappears or if very large becomes less easily felt, but if situated *in* the abdominal wall it persists (Fig. 461).

**Infection of the Abdominal Wall** can arise in any of its layers. The usual portal of entry is a laparotomy wound.

*Superficial Cellulitis.*—The earliest sign is that the skin stitches become embedded in oedematous skin, and appear wholly or partially submerged. One or more days later the pulse and temperature rise, and a cutaneous flush appears, extending for a variable distance from the incision or the stitch holes. Palpation (*with a sterile gloved hand*) will, as a rule, reveal that one area is more indurated than the remainder.

*Spreading Superficial Cellulitis* usually signifies that intestinal leakage, especially from the large intestine, is proceeding.

*Postoperative Bacterial Synergic Gangrene.*—See p. 34.

*Gas Gangrene of the Abdominal Wall* is surprisingly rare. The presence of malodorous pus containing gas bubbles is more likely to be due to a commencing faecal fistula than to gas gangrene. However, when the skin takes on a bronze hue, the wound discharges blood-stained fluid with a 'mousy' odour, and crepitation can be elicited, especially if the operation has been for a lesion of the large intestine, the correct diagnosis is certainly gas gangrene.

*'Pseudo Gas Gangrene.'*—To those unfamiliar with the phenomenon, air entrapped in the subcutis after laparotomy can be a source of anxiety, for around the incision—indeed, sometimes a considerable distance from it—unmistakable crepitation can be elicited. The condition is entirely innocuous and the air is soon absorbed.

**Abscess of the Abdominal Wall.**—Unless it arises as a postoperative complication by infection of a laparotomy incision, an abscess of the abdominal wall is, as a rule, an extension of an intraperitoneal abscess. A superficial abscess is diagnosed easily by fluctuation, and possibly by visible signs of inflammation. A



subaponeurotic abscess can be distinguished from a localized collection of pus in the peritoneal cavity only by operation.

*Tropical Pyomyositis* is a suppurative condition of muscle which may affect the abdominal wall, particularly the posterior and lateral abdominal wall, in which case psoas spasm may be in evidence (*see* p. 324). Later a retroperitoneal mass may mimic appendix abscess (*see* p. 302). The anterior abdominal muscles are seldom affected but when they are if Carnett's test is carried out it will be appreciated that the inflammatory process is *in* the muscular layer. Look carefully for manifestations in the muscles of the extremities as the abscesses are often multiple. A single abscess may simulate a haematoma following trauma.

**Is the Acutely Tender Lump in the Abdominal Wall?**—When called to see a patient with a tender lump situated in the medial part of the iliac fossa (often the right), to remember the following condition may one day bring its reward.

*Rupture of the Rectus Abdominis Muscle and/or Tearing of the Inferior Epigastric Artery* occurs usually during a bout of coughing. There is an extremely tender lump between the arcuate line and the pubic bone where the rectus ruptures. Effective tensing of the abdominal musculature causes the lump to become fixed, more obvious, and more painful. The difficulties of differentiating the condition from a strangulated Spigelian hernia (*see* p. 273) may be insuperable. Nevertheless, absence of vomiting favours the extra-peritoneal lesion, while bruising of the overlying skin (infrequent during the first 24 hours) makes the diagnosis of haematoma certain.

**Fatty Apron.**—A hanging sheet of fat below the umbilicus is almost the prerogative of the female sex in whom, in any case, obesity is much commoner (*see* Fig. 468). Failure to lift the apron in order to see what lies beneath may lead to diagnostic error (Fig. 462).

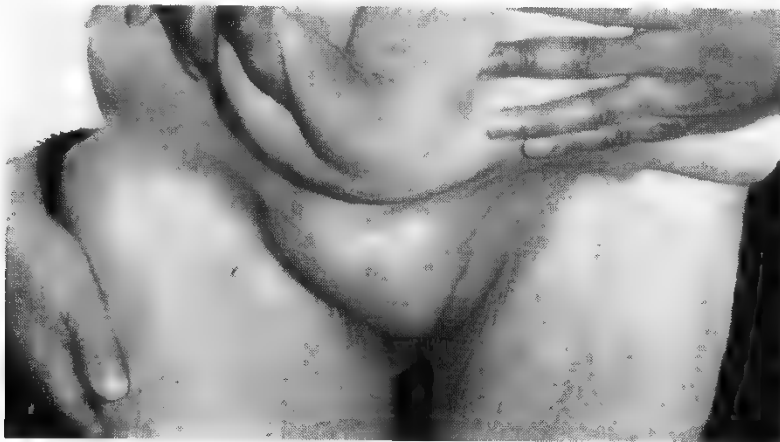
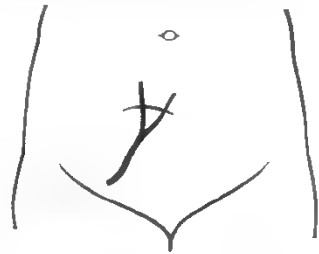


Fig. 462.—Elevation of the fatty apron in this woman aged 73 revealed a right inguinal hernia, the cause of her obscure abdominal pain for which she had already had several radiological investigations performed.

**Neoplasms of the Abdominal Wall** are uncommon. *Desmoid Tumour* *see* p. 28.

### THE UMBILICUS

Every time an abdomen is examined the eyes of the clinician, almost instinctively, rest momentarily upon the umbilicus. How innumerable are the variations of this structure! Normally, placed almost equidistant along a line joining the tip of the xiphoid process with the top of the symphysis pubis (Fig. 463), the umbilicus is displaced upwards by a swelling arising from the pelvis (Fig. 464), or downwards by ascites (Tanyol's sign), (Fig. 465).

**Exomphalos.**—The infant is born with a defect at the umbilicus, the protruding abdominal contents being covered only by a diaphanous membrane (Fig. 466).



Fig. 463.—The normal umbilicus is equidistant between the xiphisternum and the pubic symphysis.



Fig. 464.—In pregnancy and other tumours arising from the pelvis the umbilicus is displaced upwards. This patient proved to have an ovarian cyst.



Fig. 465. In ascites the umbilicus is displaced downwards. Note the small secondary umbilical hernia.

Through this transparent veil the viscera are exposed to view, as if exhibited in a show-case (Ladd).

**Congenital Umbilical Hernia** comes right through the centre of the umbilical scar (Fig. 467). At the neck of the sac one can feel a collar of fibrous tissue continuous with the linea alba (Browne). The condition is relatively much commoner in babies of African descent. The size varies from a simple failure of the umbilical ring to close completely, leaving a small defect large enough to admit the tip of the little finger with a protrusion of a small sac, to a fairly large opening admitting two or three fingers. In a doubtful case the method of seeking the hernia

depicted in Fig. 506, p. 271, can be employed with advantage, but an infant or young child should be recumbent.

**Para-umbilical Hernia.**—There is no fibrous tissue collar. It should be noted that the so-called umbilical hernia of adults (seen most often in obese females) is a *para-umbilical* hernia (Figs. 468, 469) in which approximately half the fundus of the sac is covered by the umbilicus and the remainder by the skin of the abdomen immediately *above* it. The importance of this differential diagnosis is that a *para-umbilical* hernia does not become cured spontaneously.

If either an umbilical or a *para-umbilical* hernia should protrude and remain protruded, when the patient lies down an endeavour should be made to reduce it by gentle pressure. If the hernia has existed for any length of time, reduction is usually only partially successful, for omentum becomes adherent within the sac.

**Acquired Umbilical Hernia** (as opposed to a *para-umbilical* hernia) is due to



Fig. 466.—Exomphalos.



Fig. 467.—Congenital umbilical hernia. Spontaneous closure is almost invariable.



Fig. 468. Relatively small para-umbilical hernia occurring in a typical individual for this complaint. Note the 'fatty apron' (see p. 253).

the umbilicus, which is a scar, giving way, and is always secondary to some increase in intra-abdominal tension. Therefore a search must be made for the cause—the commonest being ascites due to peritoneal carcinomatosis.

**Unfolding of the Umbilicus.**—When the abdomen becomes distended the umbilicus tends partially to unfold. This is a helpful sign in early cases of intestinal obstruction or if there is doubt about the presence of ascitic fluid.

**Omphalitis** (Inflammation of the Umbilical Cord) is, as would be expected, far commoner in communities that do not practise aseptic severance of the umbilical cord, but it is not a rarity elsewhere. About the third or fourth day signs of inflammation appear at the cutaneous junction of the stump. Unchecked, the infection is liable to spread along the defunct hypogastric arteries (Fig. 470) or the

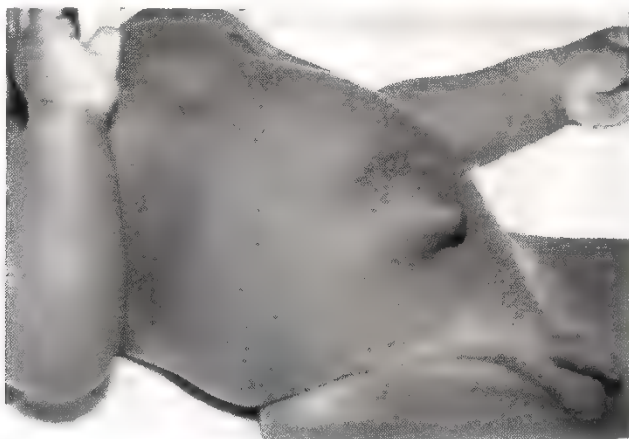
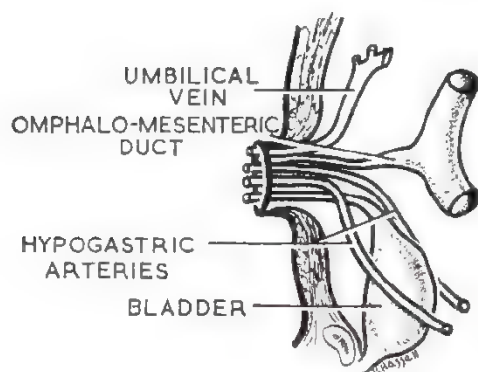


Fig. 469.—Para-umbilical hernia in a West Indian baby. This variety will not close spontaneously.

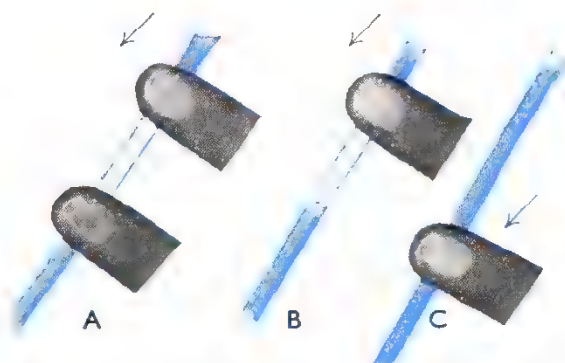
incompletely obliterated umbilical vein, as a result of which, not infrequently *an abscess of the abdominal wall* results. In such circumstances, digital pressure exerted first below (over the defunct hypogastric arteries) and, if negative, above the umbilicus will cause a bead of pus to exude from the umbilicus. Unless the abscess is drained *peritonitis* is a threatening complication. Infection along the umbilical vein

can lead to *septicaemia*, in which event jaundice is an early sign (*see p. 45*). Tetanus (*see p. 92*) is a complication seen in primitive communities.

**Congenital Umbilical Fistula.**—By exerting pressure below or above the umbilicus express and, if possible, collect some of the discharge, which may be urine

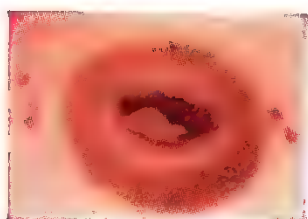


*Fig. 470.*—Structures in the umbilicus that may remain patent or incompletely obliterated.



*Fig. 471.*—Method of ascertaining the direction of blood-flow in a vein. (A) Emptying the vein of blood. (B) The inferior finger removed; vein does not fill. (C) Inferior finger replaced, superior finger removed; vein fills, proving that the flow in this case is from above, downwards.

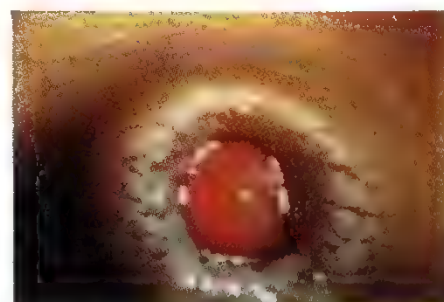
#### SOME LESIONS OF THE UMBILICUS



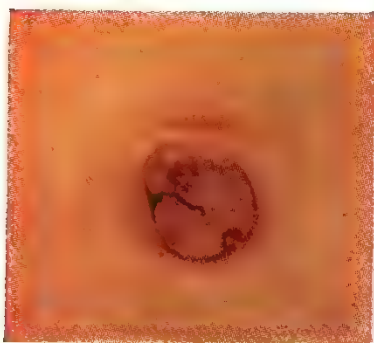
*Fig. 472.*—Umbilical fistula, the discharge from which was amniotic. Note the local dermatitis.



*Fig. 473.*—Pilonidal sinus of the umbilicus.



*Fig. 474.*—Umbilical adenoma.



*Fig. 475.*—Endometrioma of the umbilicus.



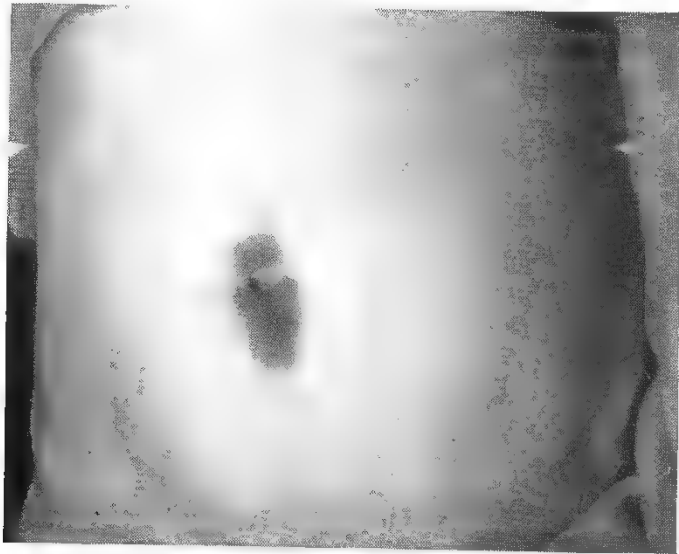
*Fig. 476.*—Secondary carcinomatous nodule at the umbilicus. The red spots near the costal margin are de Morgan's spots. (*See p. 27.*)



(urachal fistula), faeces (patent omphalo-mesenteric duct), or mucus. Local infective dermatitis (*Fig. 472*) usually accompanies any umbilical fistula.

**Acquired Umbilical Fistula.**—The umbilicus is a creek into which one of many fistulous streams can be diverted. For instance, gall-stones have been discharged through the umbilicus; a discharging umbilicus has led to the discovery of a swab left in the peritoneal cavity at a previous operation; diverticulitis or colonic carcinoma have led to a faeculent umbilical discharge.

**Umbilical Concretion,** often black in colour, and composed of dirt and desquamated epithelium, is encountered from time to time, usually in elderly subjects. Symptomless for years, a time is reached when inflammation supervenes, and a discharge, often blood-stained, causes alarm.



*Fig. 477.*—Cullen's sign. The umbilical 'black eye'.

**Pilonidal Sinus of the Umbilicus.**—If hairs are seen protruding from the mouth of an umbilical sinus (*Fig. 473*), there should be no hesitation in making this diagnosis (*see p. 282*).

**Enlargement of Veins around the Umbilicus** (*see pp. 17, 242*).

**The Differential Diagnosis between Enlarged Veins of the Abdominal Wall due to Portal Obstruction and those due to Inferior Vena Caval Obstruction.**—Below the umbilicus, the normal venous flow in the abdominal wall is downward; above it is upward.

*In Portal Obstruction* the direction of the flow is unchanged.

*In Obstruction of the Inferior Vena Cava* the flow below the umbilicus is reversed, because some of the blood is shunted through the superficial veins to the superior vena cava.

To determine the direction of the flow in a dilated vein; (1) Empty the vein as shown in *Fig. 471 A*; (2) Remove the lower finger (*Fig. 471 B*)—the vein remains collapsed if the flow is from above, downwards; (3) Replace the lower finger, and remove the upper finger (*Fig. 471 C*)—the vein fills if the flow is from above, downwards. (2) and (3) are reversed if the flow is from below, upwards.

**Umbilical Adenoma (Enteroteratoma).**—This clinical entity is most characteristic. It is a pedunculated (*Fig. 474*) raspberry-coloured mass. A similar, but somewhat paler, protuberance

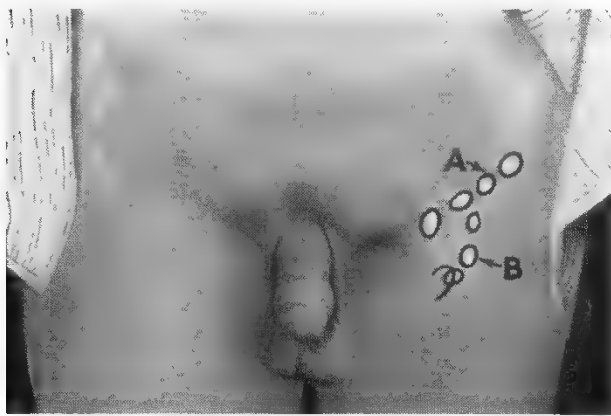


can arise from granulation tissue after separation of the umbilical cord (*umbilical granuloma*), and this disappears after two or three applications of silver-nitrate stick. This treatment has no effect on the former.

**Umbilical Endometrioma** should be suspected when, in a woman between 25 and 50 years of age, there is a growth at the umbilicus simulating an umbilical adenoma. As in other situations, an endometrioma gives rise to periodic bleeding. On inquiry, in the case illustrated (*Fig. 475*), the patient said bleeding occurred from the umbilicus at each menstrual period.

**Secondary Umbilical Carcinoma.** In advanced intra-abdominal carcinoma, more particularly carcinoma of the stomach, a neoplastic nodule can sometimes be seen (*Fig. 476*) or felt at the umbilicus.

**Discoloration of the Umbilicus.**—Rarely, in certain acute abdominal conditions, the umbilicus and surrounding skin become discoloured. If discoloration is suspected, gently clean the area with a little ether and view again. Cullen has observed a bluish tinge in cases of ruptured ectopic gestation (*Fig. 477*). Johnston noted a yellow tinge around the umbilicus in a woman with acute pancreatitis. A dirty-greenish stain has been seen in cases of intraperitoneal rupture of a hydatid cyst.



*Fig. 478.* The inguinal lymph-nodes from a clinical standpoint. A, Those along the inguinal ligament; B, Those along the femoral vessels.

## THE GROIN

### THE LYMPH-NODES OF THE GROIN

For clinical purposes there is no better division of the superficial inguinal lymph-nodes than into an oblique set beneath and parallel to the inguinal ligament, and a longitudinal set overlying the femoral vessels (*Fig. 478*). These two groups should be palpated on each side. If any are found to be enlarged, seek the primary focus. Remember that in the male and the thin female the inguinal lymph-nodes are normally palpable but no

lymph-node should be greater than 1 cm. in size, or tender.

The leg, from the toes upwards, is inspected. Should no causative abnormality be found, the abdominal wall, buttocks, anus, and the genitalia (*Figs. 479–483*) must be scrutinized for an infective lesion, because all these areas have lymphatic vessels draining into the groin. When the patient has a prepuce, it should be retracted fully, so as to expose the sulcus behind the corona. The region of the fraenum requires more than a haphazard glance; it should be so displayed that no part of it is hidden from view (*Fig. 483*). Many times has this manœuvre brought to light a primary focus hitherto undiscovered. This is an excellent opportunity to bring to the notice of those on the threshold of their life-study of human nature how often a patient suffering from venereal disease seemingly seeks to beguile his trusting clinician.

For instance, the silvery-haired, benevolent-looking possessor of the lesion displayed in *Fig. 483* insisted that a lump in the right groin (an enlarged inguinal lymph-node) appeared as the result of a strain incurred during a cricket match!

**Solitary Enlargement of Cloquet's Lymph-node** (*see p. 271*).

**When no Primary Focus of Inguinal Adenitis can be found** the clinician will do well to consider the possibility of the following conditions:—

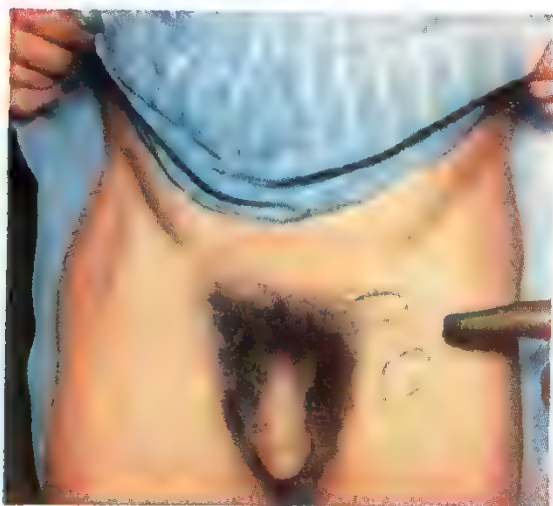
## ELUCIDATING THE CAUSE OF ENLARGED INGUINAL LYMPH-NODES



*Fig. 479.—Case I.* A patient with enlarged inguinal lymph-nodes is presented. Scrutiny of the corresponding leg and foot reveals the focus of infection in the cleft between the first and second toes.



*Fig. 480.—Case II.* Beneath the prepuce, which cannot be retracted, a hard irregular swelling is rolled between the finger and thumb. A spot of blood appears. Carcinoma of the glans penis is the primary source of the stony hard inguinal lymph-nodes seen on the right.



*Fig. 481.—Case III.* This patient says that while lifting at work he felt pain in the groin. With such a history, not unnaturally a hernia is suspected: instead, two enlarged, slightly tender inguinal lymph-nodes are found.



*Fig. 482.—Case III, continued.* Nothing is discovered to account for these enlarged lymph-nodes until the nates are separated. The patient denies that he has had even discomfort from these grossly inflamed prolapsed haemorrhoids.

1. **Cat-scratch Disease** (*see p. 34*).—The adenitis—completely antibiotic-resistant—progresses to suppuration and bubo.\* The pus obtained from the latter is green, and characteristically sterile.

2. **Reticulosis.**

3. **Tuberculous Lymphadenitis.**

In the case of (2) and (3) the enlarged nodes exhibit the same characteristics of nodes elsewhere affected similarly (*see pp. 141, 143*). Biopsy is the only means of establishing a confident diagnosis.

\* *Bubo*. Greek, βουβών = groin. An inflammatory swelling of a lymph-node of the groin.

#### 4. Venereal Disease.—See pp. 384–7.

**Abscess of the Groin.**—Any suppurating lymph-node (particularly in children) can break down and lead to an abscess. This condition should not be confused with that depicted in Fig. 484 if the clinician remembers to examine the back.

**Adenolymphocele of the Groin in Onchocerciasis.\***—The larva of *Onchocerca volvulus* are deposited subcutaneously, usually below the knee, by the bite of the intermediate host fly. They may migrate to the inguinal lymph-nodes where they are arrested and set up an intense reaction which results in destruction of the elastic tissue in the overlying skin which hangs in folds (Fig. 485) and to the uninitiated may be mistaken for inguinal or femoral hernia. However, a cough impulse is absent.



Fig. 483.—This primary chancre, situated on the right side of the fraenum and hidden beneath the prepuce, was the cause of enlargement of the right inguinal lymph-nodes.

Another manifestation is the result of the larvae migrating upwards until they reach a point where skin is adherent to underlying bone, notably at the greater trochanter. A rubbery hard nodule (*onchocercoma*) forms which consists of a tangled ball of worms surrounded by fibrous tissue.

This disease is found in Central Africa and Central and northern South America.

#### PAIN IN THE GROIN

In clinical practice this is a common symptom. We are considering here the patient in whom a cause, e.g., enlarged lymph-nodes, a groin hernia, is not obvious. Examine the hip-joint (see Chapter XXXIII) for osteo-arthritis or other disease. Re-examine carefully for a small unobtrusive



Fig. 484.—An 'abscess in the groin' from Pott's disease via the psoas sheath. A psoas abscess opening into the groin.



Fig. 485.—Adenolymphocele of the groin in a Ugandan patient.

\* *Onchocerca*. Greek, *ὄνχος* = barb, *κερκος* = tail. A genus of filarial worms.

femoral hernia which may be difficult to detect particularly in a fat person and also palpate carefully *above* the inguinal ligament for enlarged external iliac lymph-nodes. An X-ray is necessary to detect a bone metastasis (*see* p. 435) or other bone disease not causing a palpable lump. Finally, it must be admitted, in some cases, no cause can be found. 'Muscle strain' is then the usual hypothetical diagnosis but it is to be hoped that, ultimately, some definite cause will be discovered just as, in the upper limb, cervical spondylosis and carpal tunnel syndrome have been found to be the cause of previously obscure symptoms (*see* Pain in the Upper Limb, p. 478).



## CHAPTER XX

## HERNIA

FOR practical purposes, hernia, which has been defined as the protrusion of a viscus, in part or in whole, through an abnormal opening, is found only in relation to the abdomen. Exceptions are rare, e.g., lung hernia (*see* p. 193), muscle hernia (*see* p. 28). Apart from rare internal herniae which present with intestinal obstruction, a cause for which usually cannot be determined clinically, the diagnosis is obvious—a swelling is present which is easily reduced into the peritoneal cavity by



*Fig. 486.*—Watching for a visible impulse on coughing. Note that the patient's head is turned to one side. A small left inguinal hernia has appeared as the patient coughs.

pressure and which returns on invoking the aid of gravity by standing, or raising the intraperitoneal tension, particularly by coughing. However, the two varieties of inguinal hernia and femoral hernia comprise some 90 per cent of the total; groin herniae are sometimes difficult to detect and to differentiate one from the other.

**Irreducibility and Strangulation.**—A hernia which has *recently* become irreducible may have its blood-supply jeopardized and there is no clinical test to differentiate these conditions with certainty. Pain and local tenderness over the hernia are points in favour of strangulation, but there are many exceptions either way. Intestinal obstruction (*see* p. 308) associated with an irreducible hernia suggests that there is a grave risk of strangulation and that an early operation is imperative.

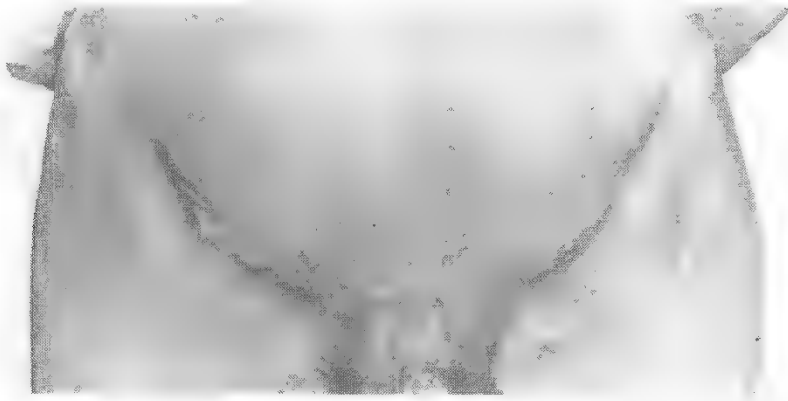
**Hernia as a Presenting Complaint of Patients with Increased Intra-abdominal Tension.**—Patients with increased intra-abdominal pressure, particularly those with ascites, sometimes present complaining of the recent appearance of a hernia. Do not fail to question the patient regarding frequency of micturition (enlarged prostate) (*see Fig. 492B*) and make an examination of the whole abdomen in relevant cases.

## INGUINAL AND FEMORAL HERNIA

**Examination of a Patient for an Inguinal or a Femoral Hernia when there is no question of Strangulation.**—The patient, stripped below the waist, stands while the examiner sits.

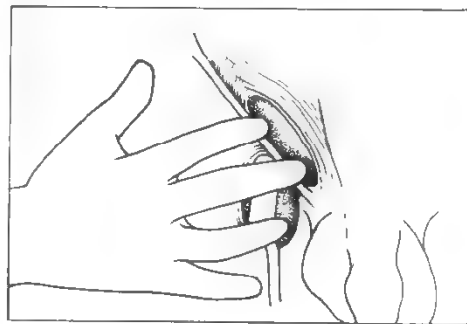


*Ascertaining the Presence of a Visible Impulse.*—An impulse is often better seen than felt. First adjust the patient. Almost certainly he will be leaning forward with his neck craning down to see what is about to be done. Tell him to hold his shirt well up and keep his head erect, then (in order that you may avoid the salivary shower when he coughs) to turn his head to one side (*Fig. 486*). Observe carefully his abdominal musculature, and ask the patient to cough or blow his nose. Malgaigne's bulgings (*Fig. 487*) are normally seen in thin individuals. With



*Fig. 487.*—Malgaigne's bulgings particularly noticeable on the left side.

the eyes glued on the external inguinal ring, request the patient to cough again. Observe whether there is an impulse. Ask him to cough once more, and compare with the ring of the opposite side. When neither a swelling nor an impulse can be seen, ask the patient to point to the place where he experienced the pain or noticed a swelling.



*Fig. 488.*—Seeking a palpable impulse (right side) (Zieman's technique). The index finger lies over the direct, the middle finger over the indirect, and the ring finger over the femoral, site.

*Ascertaining the Presence of a Palpable Impulse.*—With the patient still standing, the clinician rises and stands behind and somewhat to the right for the right side of the patient, and behind and somewhat to the left for the left side. In each instance employing the hand corresponding to the side to be examined, he places his index, middle, and ring fingers over the groin as shown in *Fig. 488*. While the fingers are maintained in these positions, the patient is instructed to hold the nose and blow (which in this instance is more effective than requesting him or her to cough). Should a hernia be present in any one of these sites, a peculiar

gliding motion of the walls of an empty sac, or pushing sensation in the case of protrusion of a viscus into the sac, is felt beneath the relevant finger.

#### INDIRECT INGUINAL HERNIA

An indirect (oblique) inguinal hernia appears for the first time earlier in life than does a direct inguinal hernia. Indirect inguinal herniae which comprise some 80 per cent of inguinal herniae, occur frequently in children, and are not rare in women.



Fig. 489.—Preparing to palpate the deep inguinal ring. The skin of the scrotum is invaginated.



Fig. 490.—The finger is then rotated so as to bring the finger-nail against the spermatic cord. The pulp will then be available to feel the deep inguinal ring.

**1. If there is no Obvious Lump.** The signs described already, viz., the presence of a visible and/or a palpable impulse, are the main avenues of arriving at a diagnosis in a female. In the case of a male, resume the seated position and examine the hernial site in the following way:—

*Digital Palpation of the Hernial Orifice.*—Employing the right hand for the right side and the left for the left, invaginate the scrotum upon the little finger (Fig. 489); then rotate the finger so that the nail lies against the cord, and follow the spermatic cord upwards—this will lead the pulp of the finger, with its tactile sensibility, to the superficial inguinal ring (Fig. 490). If the finger is not introduced in this way, it is more than likely that the nail will abut against the ring, and the point of the examination will be missed. A normal ring feels like a triangular slit; it just admits the tip of the little finger. If more of the finger than this can be introduced it is unusual, but does not necessarily signify that an inguinal hernia is present. With the little finger thus placed, ask the patient to cough. A palpable expansile impulse confirms the diagnosis of an inguinal hernia.

*Subsidiary Method of ascertaining the Presence of an Inguinal Hernia in a Female.*—Except on infrequent occasions when, as a result of great loss of weight, folds of skin hang loosely, digital palpation of the superficial inguinal ring by cutaneous invagination is entirely impracticable in the female. A sign of value is to palpate the labium majus for increased thickness, as compared with the labium of the contralateral side. Such thickening substantiates the presence of a hernial sac occupying the canal of Nuck.

**2. If there is an Obvious Lump present (in both sexes).**—By grasping the swelling between the finger and thumb, ascertain whether it is possible to get above the swelling.

*If it is possible to get above the swelling (see Fig. 493), manifestly the swelling is not issuing from the inguinal canal.*

*If it is not possible to get above the swelling, ascertain the relationship of the sac to, and its continuity with, the inguinal canal. Grasping the neck of the sac between the finger and thumb, ask the patient to cough, and note whether or not there is an impulse.*

**Method of Testing the Reducibility of an Inguinal Hernia.**—Instruct the patient to lie on an examining couch. In many instances, as soon as the patient is recumbent the hernia reduces itself. In others, the patient is able to reduce the hernia himself. If, on inquiry, the patient affirms this ability, by all means request him to carry out the manipulation. When a hernia has been irreducible for weeks or months, make no attempt to reduce it.

In the remaining cases the examiner effects reduction in the following way: flex the thigh, and in order to keep the pillars of the superficial inguinal ring relaxed, instruct the patient not to abduct the thigh. The digits of one hand surround the swelling and are used to form a funnel leading to the superficial inguinal ring, while those of the other hand grasp the swelling near the fundus. Gentle squeezing is carried out, with one hand alternating with the other. This is *taxis*.<sup>\*</sup> Forcible taxis is fraught with dangers. Contra-indications to any form of taxis at any age are:—

a. Intestinal obstruction.

b. Redness or oedema of the skin overlying the swelling (see Fig. 57, p. 26), either or both of which herald gangrene of the contents of the sac or (in the male) necrosis of the testis.

**If Reducible, Method of ascertaining the Contents of Sac.**—

*If the Hernia contains Omentum.*—In the first place it will give a doughy impression to the palpating fingers. But this is not so valuable as the second sign: the first part of the hernial contents will reduce easily, the last with difficulty (because of adhesions).

*If the Hernia contains Intestine.*—The first part is difficult to reduce; the last part is reduced with ease, and returns to the general peritoneal cavity with a characteristic gurgle.



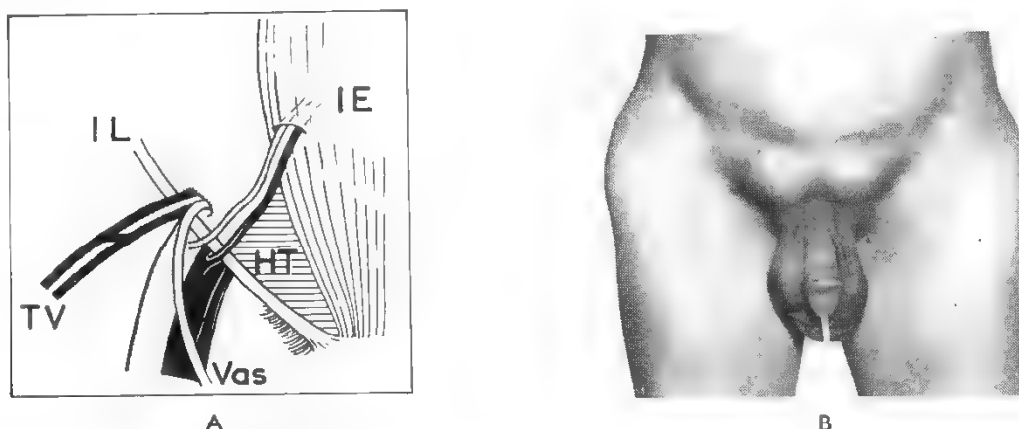
Fig. 491.—Rolling the contents of the inguinal canal back and forth beneath the finger. The sensation revealed is as if the finger of a minute rubber glove, thoroughly wet inside, were lying in the inguinal canal.

**Examination of a Child for an Inguinal Hernia.**—Babies often have a roll of fat overlapping the groin so that a small inguinal hernia is frequently overlooked. To make visible a non-apparent existing hernia, often it is helpful to encourage a child to run about or, according to age, to bounce it up and down or to allow it to jump from the examination couch, or even, deliberately, to make it cry. Palpation of the superficial inguinal ring by invagination of the scrotum is difficult or impossible in infants and young children. Gentle palpation between the finger and thumb of the spermatic cord as it emerges from the superficial inguinal ring, and comparison with the cord of the opposite side, often reveals a thickening due to the

<sup>\*</sup> *Taxis*. Greek, *τάξις* = arrangement.

presence of a hernial sac, even when the contents thereof have been reduced completely. A useful test is to roll the cord back and forth transversely beneath the gentle pressure of the index finger (*Fig. 491*), for here, again, thickening of the cord that denotes the presence of a hernia can often be detected (*Ladd*).

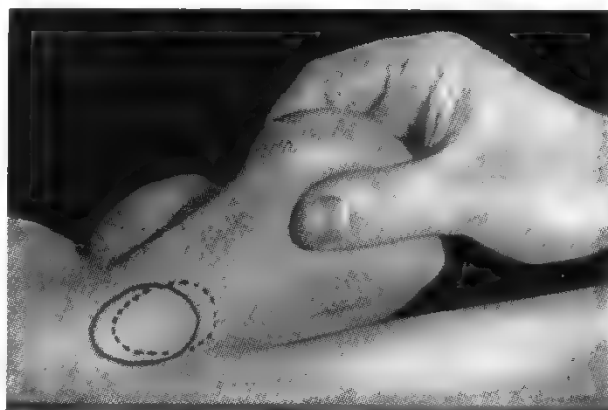
It is important to examine both inguinal regions carefully, as bilateral herniae occur quite frequently (15 per cent). At times it is impossible to confirm that an inguinal hernia is present, in which case a second examination should be arranged in a week's time or (better) when the lump appears. The greatest incidence of strangulated inguinal hernia in infancy and childhood is in the first year of life — most of them during the first three months (*Rendle-Short*). The ratio of boys to girls is 25:1.



*Fig. 492.*—A, Hesselbach's triangle, through which a direct inguinal hernia passes. Boundaries: inferior epigastric vessels, the inguinal ligament, and outer border of rectus sheath. (Right side viewed from within.) B, Bilateral direct inguinal hernia. The patient presented with acute retention of urine



*Fig. 493.* Getting above the swelling.



*Fig. 494.*—When gentle traction is exerted on the testis a hydrocele of the cord moves with the testis.

#### DIRECT INGUINAL HERNIA

A direct inguinal hernia does not come down the inguinal canal, but passes directly forwards through the inguinal (Hesselbach's) triangle (*Fig. 492 A*). While an indirect inguinal hernia may require considerable straining to manifest its presence, and definite pressure and manipulation to reduce it, a direct inguinal hernia appears as a globular swelling in close proximity to the tubercle of the os pubis on the slightest provocation, and reduces instantly on reclining because the

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wide mouth of the sac offers so little resistance to the entry of viscera. For the same reason, irreducibility and strangulation of a direct inguinal hernia are rare. Both indirect and direct inguinal herniae are often bilateral (*Fig. 492 B*). Usually a direct inguinal hernia is acquired, and it occurs in men over 40 years of age: it never occurs in children, and is relatively rare in women.

**The Differential Diagnosis between Direct and Indirect Inguinal Hernia.—**

1. On *inspection* of a direct hernia, ask the patient to cough; it is often apparent that the swelling is emerging straight through Hesselbach's triangle and not obliquely along the inguinal canal.

2. *The Sign of the Pubic Bone.*—If on exploration by invagination of the scrotum a circular opening is revealed through which, apparently, the finger passes directly backwards into the abdomen instead of obliquely upwards and outwards, it is suspicious of a direct inguinal hernia. When, in addition, the edge of the external oblique can be felt superiorly and the pubic bone can be felt inferiorly, the evidence weighs heavily in favour of a direct hernia.

3. Finally, always examine the patient in the reclining position. On lying down, a direct hernia reduces itself instantly, and the bulge reappears with equal suddenness if the patient strains.

**Differential Diagnosis between Inguinal Hernia and a Scrotal Swelling.**—*Is it possible to get above the swelling?* If, with the finger and thumb, one is able to get above the lump then obviously it cannot be a hernia (*Fig. 493*).

**Confirmatory Test for Encysted Hydrocele of the Cord.**—Grasp the testis between finger and thumb and pull gently. When traction is made on the testis, if the swelling is a hydrocele of the cord it will move downwards with the cord (*Fig. 494*). For obvious reasons this test must be carried out with extreme care.

**Differential Diagnosis between an Inguinal Hernia and a Lipoma of the Cord.**—Sometimes it can be appreciated that a swelling is emerging from the inguinal canal which does not exhibit an impulse on coughing. However, the two often coexist and usually the diagnosis is not settled until the parts are displayed at operation.

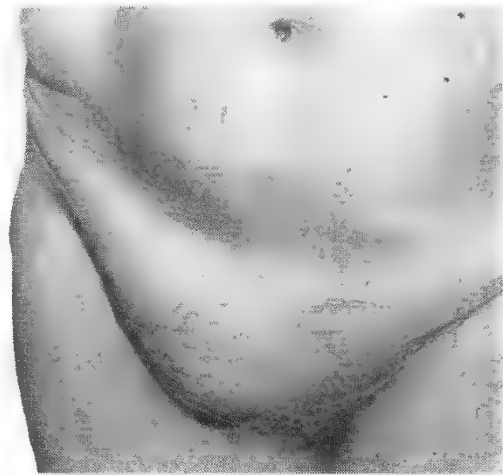
**Differential Diagnosis of an Inguinal Hernia in the Female.**—The hernia must be differentiated from other swellings of the labium majus.

A *reducible* hernia should offer no difficulty, although it may be overlooked if the patient is not examined in the standing position. On rare occasions, a psoas abscess points in the labium majus, and gives rise to a reducible swelling (*see p. 260*).

An *irreducible* hernia must be distinguished from:—

*A Hydrocele of the Canal of Nuck* (*Fig. 495*).—This is the commonest diagnostic problem. A hydrocele is smooth, fixed, fluctuant, and brilliantly translucent.

*A Cyst of a Bartholin's Gland* gives rise to a swelling (*see p. 291*) that is not usually translucent. It is confined to the labium majus, and does not



*Fig. 495.*—Hydrocele of the right canal of Nuck. The swelling is irreducible, and brilliantly translucent.

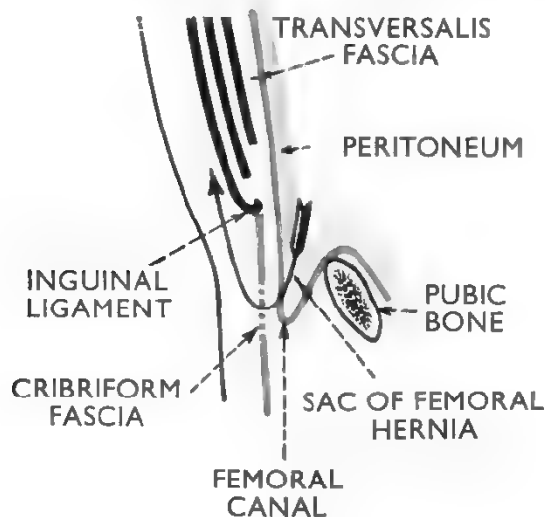


extend up to the superficial inguinal ring and it is a simple matter to get above the swelling.

**Differential Diagnosis in the Tropics between Inguinal and Femoral Hernia and Adenolymphocele of Onchocerciasis.**—See p. 260.

#### FEMORAL HERNIA

**There is no Lump.**—As in the diagnosis of inguinal hernia, so in femoral, look and look again for the presence of a visible expansile impulse when the patient coughs. The bulge of a femoral hernia is below the inguinal ligament, and after a little practice the clinician will appreciate that this fleeting bulge is placed more laterally than that of an inguinal hernia. Confirm the presence of an expansile impulse by palpation, and note the relationship of the swelling to the tubercle of the os pubis.



*Fig. 496.*—Illustrating the path taken by a femoral hernia, and explaining the appearance of the fundus above the inguinal ligament, which sometimes occurs when a femoral hernia becomes irreducible.

**There is a Lump.**—Three typical types of swelling are encountered; each is a stage in progressive protrusion of the femoral hernia along the path of the arrow depicted in *Fig. 496*.

*a.* There is a rounded reducible swelling lying below the medial end of the inguinal ligament (*Fig. 497 B*).

*b.* The hernia, after passing through the narrow confines of the femoral canal, bulges into the femoral (Scarpa's) triangle.

Usually this variety is irreducible (*Fig. 498*).

*c.* Further expansion in a downward direction being prevented by the blending of fasciae, the fundus mounts upward in front of the inguinal ligament and overlies



*Fig. 497.*—A, Inguinal and B, femoral herniae, compared. Note the relationship to the pubic tubercle (X). A small inguinal hernia lies medial to and above this landmark whereas a femoral hernia lies lateral and below.

the inguinal canal. By the time the contents have pursued so tortuous a course they are always irreducible.

**Differential Diagnosis between Inguinal and Femoral Herniae.**—As a rule the diagnosis of a femoral hernia can be confirmed by determining the relationship of the lump or the cough impulse to the tubercle of the os pubis. A femoral hernia, even when it overlaps the inguinal ligament, must always lie to the outer side of this tubercle (*Fig. 497B*). In fat individuals the landmark can be located by following up the tendon of the adductor longus to its attachment to the bone.

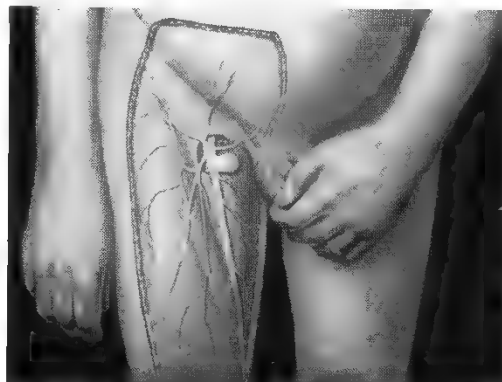


*Fig. 498.*—Large irreducible femoral hernia.



*Fig. 499.*—Differential diagnosis of inguinal and femoral herniae. The little finger is in the inguinal canal, which is empty. The swelling, therefore, obviously cannot be an inguinal hernia.

If by the invagination test it is possible to demonstrate that the inguinal canal is empty, then obviously the swelling cannot be an inguinal hernia (*Fig. 499*). Inspection of the lump may prove a veritable trap, for the swelling caused by the hernia sometimes lies above the inguinal hernia; but even in these cases the knowing eye can often detect that the swelling is placed more laterally than it is with an inguinal hernia (*Fig. 497*).



*Fig. 500.*—A saphena varix.

Palpate the swelling. Endeavour to define the neck of the sac. If the neck can be defined, then it must be contiguous either to the femoral or to the inguinal ring, and the diagnosis is clear.

Try to reduce the swelling, applying extremely gentle pressure to the fundus with the thigh flexed and internally rotated. If unsuccessful, the clinician should not persist with taxis more than a moment or two, but recall the fact that

*irreducibility is encountered ten times more frequently with a femoral hernia than with an inguinal hernia.*

**Differential Diagnosis between a Small Reducible Femoral Hernia and a Saphena Varix (Fig. 500).**—This, again, may prove a difficult problem. Both swellings give an impulse when the patient coughs, and both disappear visibly when the patient lies down. The following factors should receive due consideration.

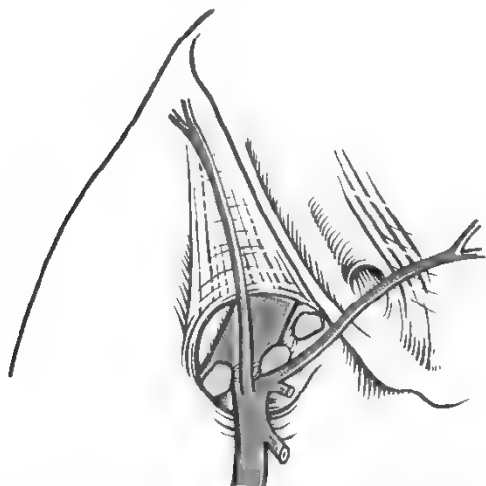


Fig. 501.—The relations of the saphenous opening. A, Inguinal ligament; B, Cloquet's lymph-node; C, Pubic spine; D, Femoral vein; E, Long saphenous vein.

1. In thin subjects a faint blue coloration of the varix is likely to be discernible in a good light.

2. Usually a saphena varix feels softer than a femoral hernia (Walker). This requires experience.

3. *Cruveilhier's Sign of Saphena Varix.*—In the erect position, when the patient coughs or blows his nose, there is a tremor imparted to the palpating fingers as if a jet of water is entering and filling the pouch.

4. A saphena varix usually is associated with pronounced varicosity of the long saphenous vein, in which case it is probable that an impulse can be transmitted

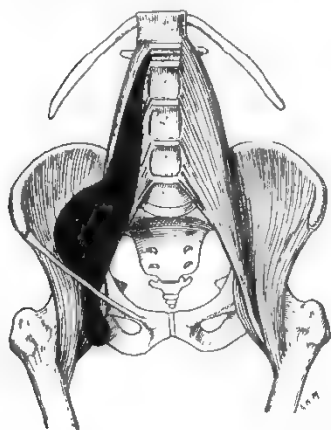


Fig. 503.—A psoas abscess usually points in the femoral triangle *lateral* to the femoral artery. If this relationship is verified, the question of the swelling being a femoral hernia should not arise.



Fig. 502.—Distension of the superficial epigastric vein associated with an irreducible femoral hernia in a woman aged 77.



Fig. 504.—Hydrocele of a femoral hernial sac.

to the swelling in the femoral triangle by percussion over the distal dilated portion of the saphenous tree (Tap Sign, *see* p. 406).

**Differential Diagnosis between a Small Irreducible Femoral Hernia and an Enlarged Lymph-node in the Position of the Femoral Ring.**—This often proves a most perplexing problem, for when the lymph-node in the femoral canal known as the lymph-node of Cloquet (*Fig. 501*) becomes enlarged, it simulates exactly an irreducible femoral hernia.

Search for a possible focus of infection. Examine the feet, legs, buttocks, perineum, anus, and genitals for a new growth, boil, blister, or an abrasion. Most patients with an irreducible femoral hernia are old and many are thin. In these the sign noted by Gaur may be seen. Pressure by the hernial sac on the superficial epigastric and/or circumflex iliac veins causes distension of one or both of these veins on the side of the hernia (*Fig. 502*).

If these signs do not elucidate the problem, there are no physical signs that will.\* The nature of the lump remains a matter of opinion that is best settled urgently in the operating theatre.

**Differential Diagnosis between a Reducible Hernia and a Psoas Abscess pointing beneath the Inguinal Ligament.**—A cold abscess arising from tuberculous disease of the body of one of the lumbar vertebrae tracking along the psoas sheath to the insertion of the psoas major (*Fig. 503*) gives rise to a reducible, painless swelling. If the pulsations of the femoral artery can be felt it will be appreciated that the swelling is lateral to the artery. Examination of the back and (when the patient lies down) palpation of the corresponding iliac fossa clarifies the diagnosis and serves to remind the clinician that purely localized regional clinical examination sooner or later causes him to stumble, perhaps seriously.

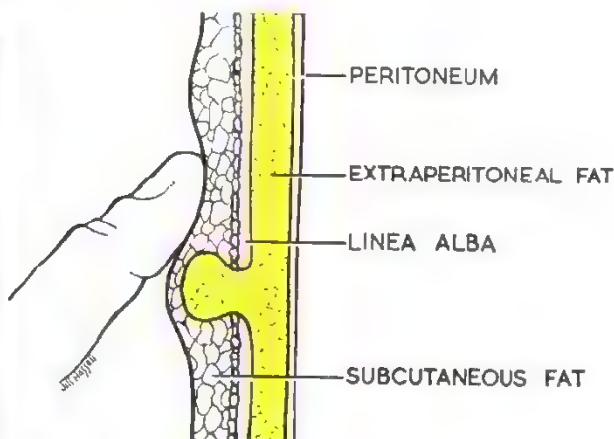
**Differential Diagnosis between an Irreducible Femoral Hernia and a Hydrocele of a Femoral Hernial Sac.**—A hydrocele of a femoral hernial sac (*Fig. 504*) is always brilliantly translucent.

### EPIGASTRIC HERNIA

An epigastric hernia, also, and more explicitly, called a fatty hernia of the linea alba (*Fig. 505*), can often be seen if the patient is spare and is placed in an oblique light.



*Fig. 505.*—Epigastric hernia visible only when the patient was examined standing up. He complained of symptoms suggesting a peptic ulcer.



*Fig. 506.*—Method of seeking an epigastric hernia.

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\* An abdominal X-ray taken with the patient in the erect position showing fluid levels indicates that intestinal obstruction is present and that the swelling must be an irreducible femoral hernia.

Frequently, the smaller an epigastric hernia the greater the symptoms, which often simulate those of a chronic peptic ulcer. Many escape detection—but not if the following method is employed:—

With the patient standing, exercising gentle pressure, draw the pulp of the index finger along the linea alba between the xiphoid process and the umbilicus. A small (they are often tiny) epigastric hernia will be palpable as a nodule (*Fig. 506*), occasionally reducible.

### INCISIONAL HERNIA

The patient has had an abdominal operation and the hernia is usually obvious. Occasionally the test illustrated in *Fig. 506* is of value when the possibility of a small incisional hernia through the anterior abdominal musculature is being considered.



*Fig. 507.*—Incisional hernia through a gridiron appendectomy scar; dangerous variety



*Fig. 508.*—The palpating fingers sinking into the gap resulting from a large incisional hernia.

If there is still doubt, ask the patient to stand and re-examine him. A protrusion through the abdominal musculature indiscernible when the patient was lying down may become obvious.

With a moderate-sized or large incisional (ventral) hernia define the margins of the neck of the sac. The *dangerous* variety has a narrow neck (*Fig. 507*) which will only admit a finger or two, whereas with the *relatively safe* type on palpation, when the abdominal musculature is relaxed fully, the fingers discern a wide gap through which several fingers or the whole hand can sink (*Fig. 508*).

### HIATUS (DIAPHRAGMATIC) HERNIA

Most sufferers from this condition are over 50 years of age; the fat are more frequent victims than the lean; there are no physical signs.

*Pain* is the dominant symptom. Its chief sites are shown in *Fig. 509*. It is not unusual for the patient to experience pain localized in more than one of these areas. What is extremely characteristic is that the pain is made worse by stooping, and sometimes by lying down.

*Haematemesis.*—Serious haematemesis or melaena occurs in 10 per cent of cases. The cause of the bleeding is peptic ulceration within the herniated portion of the stomach.

*Perforation* of such an ulcer is a rarity. So is the most important complication of external hernia, viz., strangulation, which complicates only the congenital and



post-traumatic varieties in which a large opening may exist in the diaphragm. Respiratory movement of the left chest is restricted and bowel-sounds may be heard in the chest. A radiograph is essential to establish the diagnosis.

When the hernia is large, occasional bouts of hiccup from irritation of the phrenic nerve occur. In a few patients agonizing attacks of substernal pain, simulating that of angina pectoris, are a leading symptom, in which event the diagnosis can be established only by negative electrocardiographs and positive radiological signs of hiatus hernia.



Fig. 509.—Localization of pain in a hiatus hernia. Red, principal locations; white, less common, or subsidiary, locations.

*Hiatus Hernia in Infants.*—The outstanding feature is effortless vomiting, often blood-stained, dating from shortly after birth and persisting. *See also* Cyanosis on Feeding a Newborn Infant, p. 200.

Hiatus hernia has become a fashionable diagnosis, and is demonstrated in about a third of patients submitted to a carefully carried out barium meal X-ray. The reader must therefore be vigilant lest an incidental, probably symptomless, hiatus hernia is accredited with the causation of symptoms due to another lesion.

**Umbilical Hernia.**—*See* p. 254.

#### SOME RARE HERNIAE

**Obturator Hernia** can be recognized only when it strangulates. It almost always occurs in thin females over 60 years of age. The symptoms are often obscure, for frequently the strangulation is of the Richter type.\* The swelling is liable to be overlooked because the hernia is covered by the pectineus muscle, but a fullness (or even a lump) in the femoral triangle on one side is a suggestive sign. The pubic ramus lies above the lump; with a femoral hernia it lies below. Usually the patient maintains the limb on the affected side in semi-flexion, and movements of the hip-joint are limited by pain. Often the pain is referred along the obturator nerve to its genicular branch—the Howship-Romberg sign of pain in the knee. On vaginal examination sometimes the hernia can be felt as a tender swelling in the region of the obturator foramen.

**Spigelian Hernia** occurs through the linea semilunaris. It seldom causes symptoms unless strangulation occurs, when it gives rise to an exquisitely tender lump in the abdominal wall, usually parallel to the inguinal ligament, and about 4 cm. above it. Provided the clinician is certain

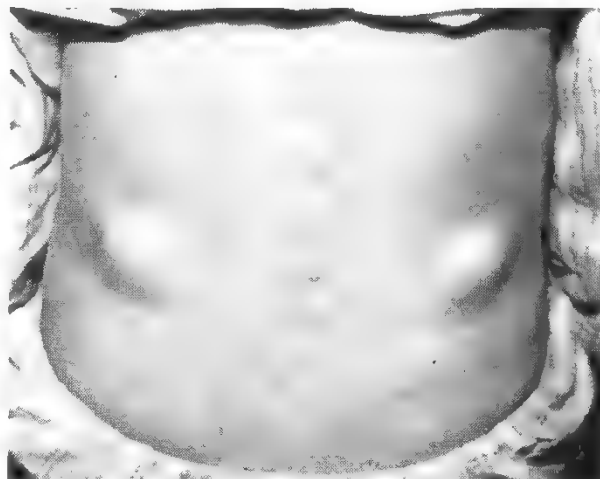
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\* *Richter's Hernia* = strangulation of a portion only of the circumference of the intestine.

that the lump is *in* the abdominal wall (*see* Carnett's test, p. 252), the diagnosis is simplified considerably.



*Fig. 510.*—Right interstitial hernia associated with indirect inguinal hernia.



*Fig. 511.*—Bilateral lumbar herniae.

**Interstitial (Interparietal) Hernia.**—The sac passes between the layers of the abdominal wall in the region of the inguinal canal and is often associated with an inguinal hernia (*Fig. 510*). If the inguinal hernia can be reduced, a swelling is left which also reduces at or near the deep inguinal ring.

**Lumbar Hernia** (*Fig. 511*).—This term does not include the hernia following an operation on the kidney, which is an incisional hernia.

## CHAPTER XXI

## RECTAL AND VAGINAL EXAMINATION

## ANORECTAL EXAMINATION

MANY times the omission of a rectal examination has been a cause of regret. 'If you don't put your finger in, you put your foot in it.' In the acute abdominal case, 'It is more important to insert the finger into the lower end than to put the thermometer into the upper end of the alimentary tract' (Cope).

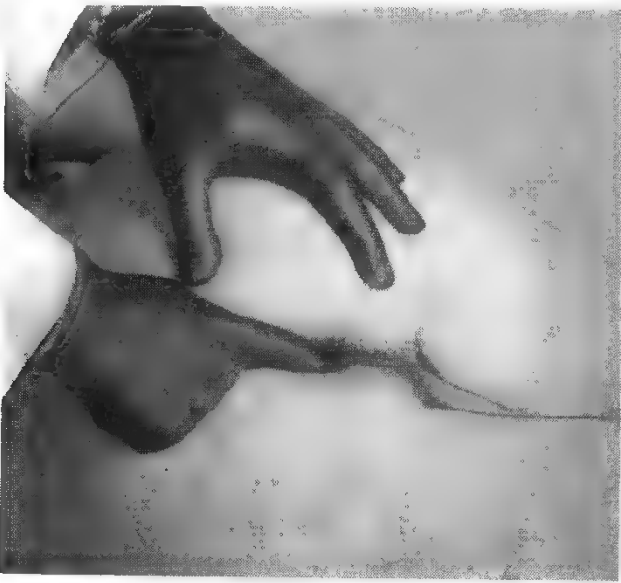


Fig. 512.—Left lateral position.



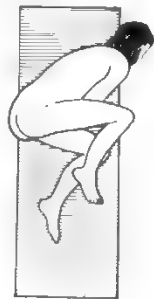
Fig. 513.—Knee-elbow position.

**Position of the Patient.**—The examination can be made in one of four positions, each having its advantages and special uses.

1. *The Left Lateral (Sims's) Position* (Fig. 512) is employed as a routine in women. It is also used as a standard procedure in the male in most clinics. Note that the upper (right) leg should be flexed while the lower (left) is semi-extended. The buttocks should project over the edge and the trunk should be *across* the couch or bed rather than parallel to its edge.

2. *The Knee-Elbow Position* (Fig. 513) is efficacious, particularly when the prostate and seminal vesicles are to be palpated.

3. *The Dorsal Position*, with the patient lying semi-recumbent and his knees flexed, is the position to be chosen when it is desired to make an examination of the interior of the pelvis in an ill patient when alteration of posture is contra-indicated. The examiner passes his arm beneath the right thigh (Fig. 514). The index finger in the rectum is used in conjunction with the other hand upon the abdomen, for the size and other characteristics of a pelvic swelling can be estimated only by bimanual palpation. In this way fair access to the rectovesical pouch



(Fig. 515) or to the pouch of Douglas (which in the circumstances mentioned is the main point of the examination) can be effected with minimum disturbance to the exhausted patient.



Fig. 514.—The dorsal position. Method to be adopted when the patient is too ill to be subjected to much movement.

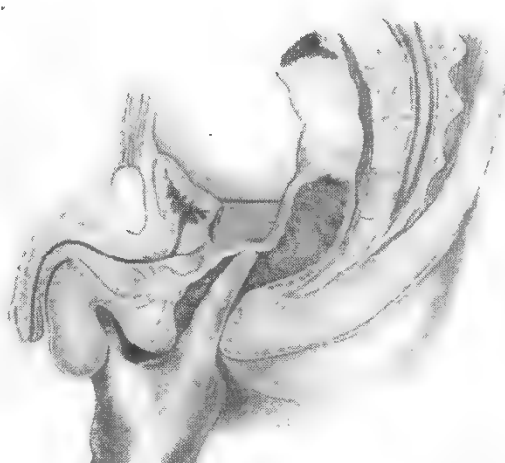


Fig. 515.—Palpating the rectovesical pouch in a case of peritonitis. In this instance there is a collection of pus, which imparts a softly cystic impression to the palpating finger. As a rule the swelling is exquisitely tender.

4. *The Lithotomy Position*.—To make the examination in the full lithotomy position it is necessary to have facilities for the use of an operating table. When a bimanual rectal (or vaginal) examination is made with the patient in this position (Fig. 516) the pelvic viscera become more accessible and a lesion high in the rectum is more likely to be felt. This is the best position, but it is not usually available to the student and in domiciliary practice. Be that as it may, in almost all instances a rectal examination performed in one of the first three positions will give all the information that is required to formulate a correct diagnosis.

For the average clinician 10 cm. is the probable limit of digital exploration.

**Anatomical Structures felt by a Finger in the Rectum.**—

1. *The Anal Groove (anal intermuscular depression)*.—Just inside the anal verge, a groove can be felt. This corresponds to the dividing line between the external and the internal haemorrhoidal plexus. It lies between the external and internal sphincter muscles.

2. *The Anorectal Ring* is situated at the junction of the anal canal (which, in the adult, is 2–3 cm. in length) and the rectum. The posterior and lateral parts of the ring are felt easily, because of the sling-like arrangement of the puborectalis component of the levator ani muscle. The recognition of these muscular landmarks is of prime importance in determining the location of an anorectal abscess (see p. 287) or a fistula-in-ano (see p. 281).

Above the anorectal ring the finger enters the spacious lower rectum.

3. *The Lowest Valve of Houston*.—The ascending finger sometimes impinges on this soft fold of mucous membrane.

4. *The Sacral Promontory*.—The lower part of the sacral promontory, as it curves forwards and upwards, can be felt, and in some individuals this can be employed as a point for orientation when palpating pelvic structures. The finger, moved laterally, can identify the *spine of the ischium*.

JAMES DOUGLAS, 1675–1742, *Anatomist and 'Man Midwife' in London. Physician to Queen Caroline, wife of George II.*

JOHN HOUSTON, 1802–1854, *Physician, City of Dublin Hospital, Ireland.*

5. *The Prostate or the Cervix Uteri.*—Sweeping the finger around the lateral wall until the pulp of the finger passes anteriorly, the prostate gland or the cervix uteri will come to lie beneath the finger.

a. *The Prostate:* Digital examination of the prostate is considered in detail on p. 366.



Fig. 516. Bimanual palpation of the rectum with the patient in the lithotomy position.



Fig. 517. —Characteristic attitude of a patient with an acute anorectal condition awaiting his turn for a consultation.

b. *The Cervix Uteri:* The *pons asinorum*\* of a rectal examination is the cervix which can be felt projecting through the anterior rectal wall. Even after considerable experience, its inconstant size and shape may, in a given case, cause momentary bewilderment. So great is the pitfall that, in making a rectal examination in the female, it should be the rule to find the cervix deliberately first, and take bearings from it.

Having mastered these theoretical considerations, the time is ripe to consider the practical applications of this frequently indispensable procedure, the when, the how, and the interpretation of which is a hall-mark of clinical acumen.

Before commencing the description of the findings in various anorectal lesions, it is well to draw attention to the sitting posture (Fig. 517) adopted by many a patient with an acute anorectal condition, notably prolapsed haemorrhoids or a perianal abscess.

**Anorectal Examination.**—Inspection must never be omitted. When a female is being examined disregard of this fundamental rule has many times led to a mistake, and the finger has been introduced into the wrong orifice. Furthermore, it often yields information of cardinal importance; for instance, rectal prolapse (Fig. 518), prolapsed internal haemorrhoids, and pruritus† ani (Fig. 519) can be diagnosed at sight. An external haemorrhoid (Fig. 520), or haemorrhoids, which are covered with skin, are at once apparent. In relevant cases look for the external orifice of a fistula-in-ano (Fig. 521) or the sentinel tag of a fissure (see Fig. 525). Perianal warts

\* *Pons asinorum*. Latin = the bridge of asses. Euclid, Book I, Proposition V. A difficult problem for beginners.

† *Pruritus*. Latin, *prurire* = to itch.



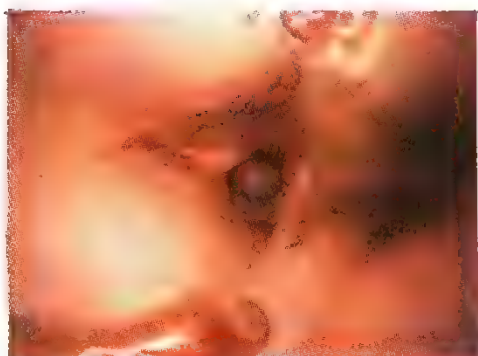
## SOME CONDITIONS REVEALED BY INSPECTION OF THE ANUS



*Fig. 518.*—Prolapse of the rectum (procidentia). Note the circumferential folds of mucous membrane.



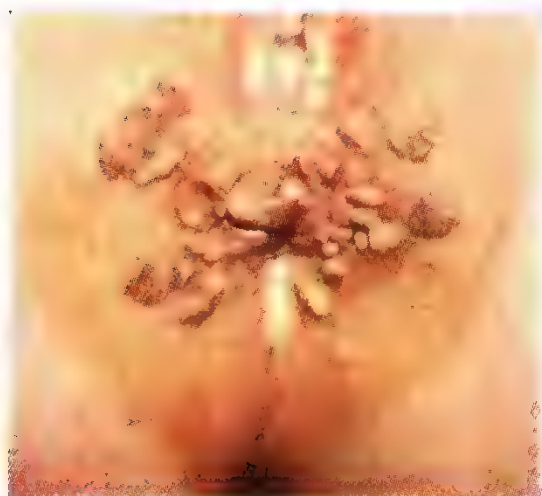
*Fig. 519.*—Pruritus ani with cutaneous tags which are probably the cause of the irritation.



*Fig. 520.*—'Thrombotic pile' (syn., external haemorrhoid)—subcutaneous rupture of an anal venule.



*Fig. 521.*—Fistula-in-ano. Illustrating Goodsall's rule (*see* p. 281). The fistula is of the direct anterior type.



*Fig. 522.*—Perianal warts.



*Fig. 523.*—Internal haemorrhoids can be seen coming into view as the patient strains.

are very obvious (*Fig. 522*). Ask the patient to 'strain down', observe the relaxation of the corrugator cutis ani of Ellis, followed by relaxation of the external sphincter, and, in a normal person, the very slightest protrusion of mucosa. As the patient strains, internal haemorrhoids, which before were hidden from view, may now slowly protrude (*Fig. 523*). If the sphincter is tightly closed in spite of the patient 'straining down', be suspicious of a fissure-in-ano (*see p. 280*).

**Melanoma of the anus** presents as a bluish-black, soft mass, which is confused with a thrombotic pile but does not resolve spontaneously in 2 or 3 weeks as does the latter. As the melanoma ulcerates, its black colour is lost. The inguinal lymph-nodes are involved early.

**Technique of Rectal Palpation.**—At the present time disposable gloves (*see Fig. 1, p. 2*) are easily the most convenient as they are cheap and can be thrown away. Prior to the examination the gloved finger should be lubricated. At the end of the examination wipe the lubricant away. If you omit this latter point it is extremely uncomfortable for the patient when dressed.

**Method of Introducing the Finger.**—One of the greatest factors in an efficient rectal palpation is that it should be a painless process. To a very large extent this can be achieved by correct technique. Always warn the patient what you are about to do. After you have placed him in the desired position, say: 'I am now going to examine the back passage. It will not hurt you. Open your mouth and breathe quietly in and out, and keep on breathing through your mouth.'

Lay the pulp of the index finger flat upon the anal verge (*Fig. 524*), and exert firm pressure until the sphincter is felt to yield. Then, with a rotary movement, the finger is introduced *slowly*. If the rectum is found to be full of hard faeces, it will be wise to defer the examination (unless the case is urgent) and record this fact in your notes. In the absence of this stumbling block, when engaged in an examination of the rectum, unless there is some striking abnormality, it is well to have in mind a routine, a kind of formula, which will synchronize the brain and finger. Proceed in order, palpating and thinking all the time of what you are doing.

#### PALPATION OF THE RECTUM

<i>In the Male</i>	Anterior wall	1. Prostate, left lobe, right lobe
		2. Seminal vesicles, position of left vesicle, position of right vesicle
		3. Rectovesical pouch
	Left lateral wall	
	Right lateral wall	
	Superiorly, as far as can be reached	
	Posteriorly	Hollow of sacrum
		Coccyx
<i>In the Female</i>	Cervix	
	Pouch of Douglas	
	Left lateral wall	
	Right lateral wall	
	Superiorly, as far as can be reached	
	Posteriorly	Hollow of sacrum
		Coccyx

It is not unusual for the advancing finger to push a lesion of the rectum before it. Therefore, in its upward course, after the anorectal ring has been passed, endeavour to steer the finger-tip clear of the rectal walls. Having reached the highest limit, flex the finger and withdraw it partially. Repeat the process at other

cardinal points of the compass, for a *soft lesion of the rectal wall is more likely to be felt on the downward stroke of the finger than on its upward course.*

Having completed the routine palpation, look at your finger for blood, mucus, or pus: better still, wipe it on a gauze swab, which will show up the colour of the discharge.

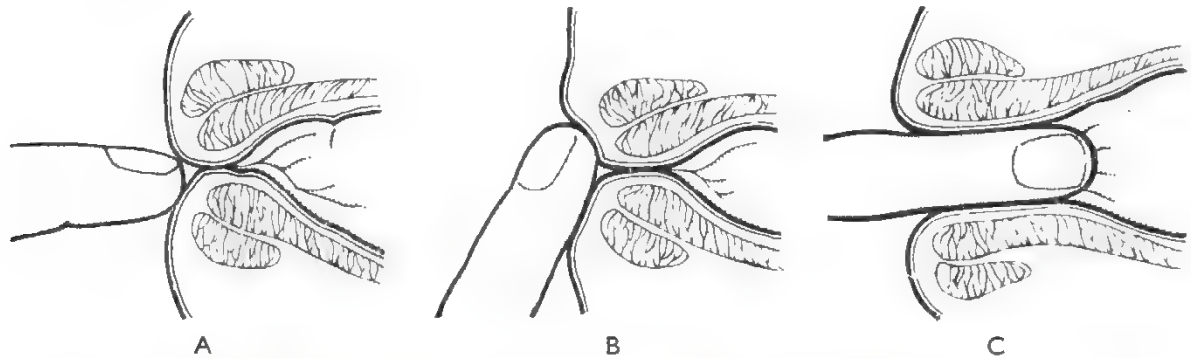


Fig. 524. Rectal examination. A, The wrong way of introducing the finger. B, The correct manner of commencing the examination: firm pressure is exerted until the sphincter is felt to relax. C, The finger has entered the anal canal and is about to enter the rectum.



Fig. 525.—Method of displaying a fissure-in-ano. The fissure is seen as a crevice lined by granulation tissue. The crevice has been well described as a canoe-shaped ulcer. In this case, at the distal end of the fissure a sentinel pile can be seen. In some instances, at the proximal end there is a hypertrophied anal papilla. The similarity to a Canadian canoe is then heightened.

#### DIGITAL FINDINGS IN VARIOUS ANORECTAL CONDITIONS

**Fissure-in-ano.**—First let us consider a common condition where routine palpation must be halted. In fissure-in-ano the anal sphincter is in spasm; it is impossible to introduce the finger without causing pain. This is an occasion where rectal examination, as such, is contra-indicated, but the anal canal must be examined with especial care. With the pulps of the index fingers gently separate the folds of anal mucosa (Fig. 525) and look for the fissure, especially in the middle line

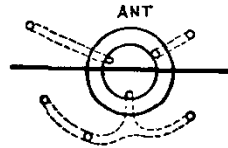
posteriorly. A so-called sentinel\* pile is nothing more than a cutaneous tag which sometimes marks the distal extremity of the fissure.

Fissure-in-ano is not uncommon in children, and probably because the condition is not even thought of, let alone looked for, in a young child the diagnosis is frequently missed.

**Fistula-in-ano** is a track, lined by granulation tissue, resulting from an anorectal abscess that bursts spontaneously, or was opened inadequately. If the opening is large enough for pus to escape, pain is not a symptom, and the principal complaint is that of a purulent discharge which causes local irritation and discomfort. Frequently there is a solitary external opening, usually situated within 4 cm. of the anus, presenting as a small elevation with granulation tissue pouting from the mouth of the opening (*see Fig. 521*).

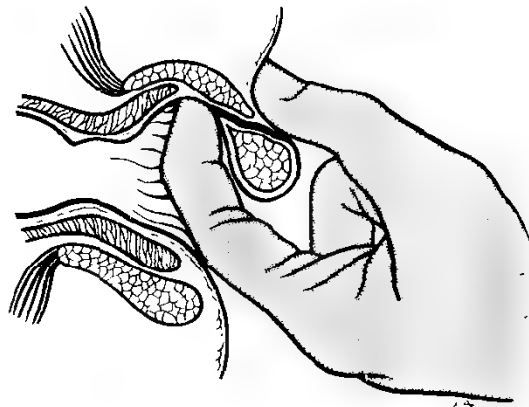
**Goodsall's Rule.**—Fistulae with an external opening in relation to the anterior half of the anus tend to be of the direct type; those with an external opening or openings in relation to the posterior half of the anus usually have curving tracks (due to outward deflexion of the pus around the sides of the pubo-rectalis muscles) with the internal opening in the mid-line (*Fig. 526*), and may be of the horse-shoe variety.

*Fig. 526.* Illustrating Goodsall's rule.



Introduce a finger into the anal canal. Not infrequently the internal opening of the fistula can be felt as a small elevation about a centimetre from the anal verge. A common mistake is to search for an internal opening too high.

Probing a fistula-in-ano is often undertaken as part of the *clinical* examination. This has nothing to recommend it—even if the lightest pressure is used, it is easy to direct the probe through the lining granulation tissue, and not only to get a false impression of the direction of a tortuous fistula, but to complicate the situation by creating a side-track, and perhaps to initiate an exacerbation of the inflammatory process. Far better is it to rely on bidigital palpation combined with a clear mental picture of the relevant anorectal musculature. By inserting the index finger into the rectum, and then by utilizing the thumb of the same hand, all the tissues between the skin and the mucous membrane (*Fig. 527*), from the pelvic floor above to the anal verge below, can be palpated. Except in tuberculous fistulae induration around a fistula can be recognized as a firm cord.



*Fig. 527.*—Bidigital palpation for tracking the induration around a fistula-in-ano which feels like whip-cord.

#### **Special Types of Fistulae-in-ano.**—

1. *Fistula associated with a Fissure.*—In this instance pain (due to the fissure) is a leading symptom. The external orifice of the fistula frequently lurks beneath an overhanging sentinel pile. The internal orifice is in the fissure itself. Though short and tiny, this fistula gives troublesome symptoms.

\* Sentinel—so called because it metaphorically watches over the fissure.



2. *Fistulae with Many External Orifices* suggest one of several diseases, each of which must be considered: tuberculous proctitis, regional ileitis, ulcerative colitis with proctitis, bilharziasis, lymphogranulomatous stricture of the rectum, colloid carcinoma.

If the induration around the fistula is lacking, if the opening is flush with the surface and ragged, if the surrounding skin is discoloured and the discharge watery, it suggests that the fistula is due to a tuberculous infection. Lymphogranulomatous stricture is considered on p. 285. Extensive surrounding induration and a blood-stained discharge should call to mind the possibility of colloid carcinoma.



Fig. 528. Pilonidal sinus with several openings.



Fig. 529.—Under anaesthesia just prior to operation, a probe has been passed from one opening to emerge from another in the same case.

**Pilonidal\* Sinus.**—A large proportion of patients arrive at the out-patient department as 'fistula-in-ano' or 'ischio-rectal abscess'. Observe the opening of the sinus. It is situated in the middle line, near the base of the coccyx, and is really quite a distance from the anus and ischio-rectal fossae. Often multiple openings are present (*Figs. 528, 529*). Purulent fluid and sometimes loose hairs can often be expressed by pressure over the last segment of the sacrum. When the small mouth of the sinus becomes blocked, the contents become bottled up and a tender swelling is present; often this overlies the sacro-coccygeal area to one or other side of the middle line. Patients often are dark, hairy men.

*Pilonidal Sinus of the Umbilicus* (see p. 257).

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\* Pilonidal—so called because it contains a nest of hairs.



*Barber's Pilonidal Sinus* (see p. 488).

**Internal Haemorrhoids.**—If neither engorged nor thrombosed internal haemorrhoids are so soft that they cannot be felt with the finger. The insertion of a proctoscope is necessary to detect their presence.

**Pruritus Ani.**—There is an intractable itching around the anus. Broadly speaking, there are two varieties—the moist and the dry. In the moist variety there is usually a causative lesion, which includes an anal fissure, a fistula-in-ano, and prolapsed or external haemorrhoids; excessive ingestion of liquid paraffin can also produce a moist, irritable anus. A vaginal discharge, particularly one due to the *Trichomonas vaginalis*, can cause irritation of the anus, as also (especially in young subjects) can threadworms (*Enterobius vermicularis*). When the anal skin shows some form of dermatitis which has a well-defined border, mycotic disease of the skin due to yeasts or fungi should be suspected. Culture examination of the mucopus taken from the region is necessary to establish the diagnosis in this instance.

Any of the foregoing produces in time lichenified pruritic skin around the anus (see Fig. 519).

Of the drier varieties without a demonstrable cause, consider the possibility of diabetes, lack of personal cleanliness, or excessive sweating.

**Rectal Prolapse.**—*a. Prolapse of the Mucous Membrane* without haemorrhoids is rare in adults, but not particularly so in children. The protrusion is seldom more than 2 cm. beyond the anal verge and, what is of prime importance, the mucous membrane is directly continuous with the perianal skin (see Fig. 567 a, p. 314). If the mucous membrane is allowed to protrude for any length of time it becomes eroded in places and bleeds, and tends to lose its pristine gloss. Prolapsed haemorrhoids are characterized by soft, sessile, deep-red *hillocks* on the mucous membrane.

*b. Rectal Procidentia*\* is applied to a sliding hernia of all coats of the rectum, including a portion of the recto-uterine or -vesical pouch. The condition is much commoner in women. It is diagnosed easily (1) because the protrusion is marked by circular folds in the mucous membrane (shown in Fig. 518), and (2) unlike prolapse of the mucous membrane, a sulcus exists between the protrusion and the perianal skin, enabling a finger to be passed in an upward direction between these two structures for a varying distance.

*c. Sigmoidorectal Intussusception.*—In some individuals the distal sigmoid is extremely mobile and possesses a long mesentery, and from time to time intussusception occurs, which, if it fails to reduce itself spontaneously, protrudes at the anus. The appearance is similar to the above, but the examining finger inserted between the prolapse and the perianal skin, instead of coming to a full-stop at the bottom of a sulcus, passes *ad infinitum* into a bottomless pit (see Fig. 567, p. 314).

All varieties of rectal prolapse are favoured by a relaxed external sphincter. Should, however, the sphincter be capable of acting strongly and it goes into



Fig. 530.—Prolapsed internal haemorrhoids with strangulation. Three hours before admission the haemorrhoids came down, and could not be replaced.

\* *Procidentia*. Latin = a prolapse, or falling down.

spasm after the protrusion has occurred, strangulation will result and gangrene of the prolapsed mass becomes possible. It occurs most frequently in prolapse of the mucous membrane bearing internal haemorrhoids ('strangulated piles') (Fig. 530).

**Sphincter Relaxation.**—Loss of sphincter tone can be demonstrated by digital traction on the sphincter when the finger is inserted into the anal canal and hooked above the anorectal ring. If, by this means, the sphincter can be made to gape so that the rectal lumen is displayed, a subnormal sphincter tone is certainly present.

Diminished tone, or absence of normal resistance to the entry of the finger into the anal canal, is due to damage to the sphincters, resulting from child-birth, a badly planned operation for fistula, congenital defects, commencing tabes dorsalis or other disease of the spinal cord, and, most commonly, senility.

**Carcinoma of the Rectum** does occur in patients under 40 years of age, but, as might be expected, usually the sufferer is older. As the neoplasm can be felt digitally—in early cases as a plateau or as a nodule with an indurated base—it is incumbent upon the clinician to make a routine digital examination in every patient who complains of having passed blood per rectum, or in whom there has been a recent change in bowel habit. In this respect, as far as the general practitioner's responsibilities are concerned, rectal examination reaches its zenith of importance. When the centre of the plaque or nodule ulcerates, a shallow depression will be felt, the edges of which are raised and everted (Fig. 531). This, combined



Fig. 531.—The finger encounters first the edge of a carcinomatous ulcer. When the ulcer is situated some distance from the anus the floor of the ulcer may be out of reach.

with induration of the base of the ulcer, is a frequent and unmistakable finding. If one of the above findings is encountered determine whether it is possible to get above the growth. Next feel around the whole circumference of the bowel and decide the relationship of the neoplasm to the circumference. In this way, more often than not, one is enabled to ascertain whether the tumour is of the annular, tubular, ulcer, or cauliflower type. By trying to move the growth gently it is possible to discover whether it is fixed to the surrounding structures or tethered at any one point (e.g., to the sacrum). On withdrawing the finger, the glove is frequently blood-stained.

See also Bidigital Anovaginal Examination, p. 289.

#### **Benign Tumours of the Rectum.**

**Adenomatous Polyp** occurs as a bright red, slightly lobulated, pedunculated tumour in the lower rectum. Nearly always advice is sought because of the passage of bright red blood, or blood-stained mucus, per rectum. If the pedicle is long enough, the adenoma appears at the anus during defaecation, causing pain and tenesmus.\* On rectal examination sometimes it is possible to hook down the polyp with the examining finger (Fig. 532).

A **Fibrous 'Polyp'** springing from the anorectal junction is not uncommon in

\* *Tenesmus*. Greek, *τενεσμός* = straining, especially ineffectual and painful straining at stool.

adults. This is not a neoplasm, but a result of either fibrosis of an internal haemorrhoid, or (as revealed by proctoscopy) more frequently a hypertrophied anal papilla.



Fig. 532.—An adenomatous rectal polyp showing (inset) the method of hooking it down.

A *Villous Papilloma* feels soft and velvety, or, where the fronds are lush, almost gelatinous. As a rule it covers a relatively large area of rectal mucosa and bleeds on being palpated.

**Benign Stricture of the Rectum** is encountered less frequently than an annular carcinoma except in regions where *lymphogranuloma inguinale* (see p. 386) is rife. Bear it in mind if the stricture is rubbery and tubular in character. Occasionally a narrow circular crescentic fold is felt 4 cm. from the anal verge in a young person. This is a *congenital stricture* due to imperfect fusion of the hind-gut with the proctodeum. A *fibrous stricture* in this neighbourhood in an adult is likely to be the result of an ill-performed operation for internal haemorrhoids, but it may result also from other conservative operations on the rectum or anal canal. One of the most common forms of benign stricture of the rectum encountered at the present time is that following radium treatment for carcinoma of the cervix uteri. When a supposed

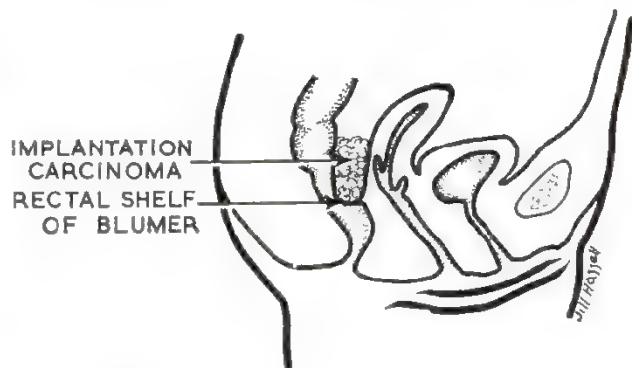


Fig. 533.—The rectal shelf of Blumer. In this case it is due to transcoelomic implantation of cancer cells from a carcinoma of the stomach to the recto-vesical pouch.

inflammatory stricture of the rectum bleeds on digital palpation, carcinoma should be suspected.

**Senile Anal Stenosis.**—The external sphincter becomes fibrosed, and the entrance to the anal canal grasps the examining finger like a tight umbrella ring. Partial obstruction due to faecal impaction above the stricture is the usual reason for calling attention to the condition.

**The Rectal Shelf of Blumer** is encountered on rectal examination performed (a) on account of rectal symptoms; (b) as a routine measure in cases of suspected carcinoma of the stomach. The shelf is due to an extrarectal mass causing an indentation of the anterior wall of the rectum (Fig. 533) and can be distinguished from a stricture involving the mucous membrane of the rectum by the fact that it does not encircle the entire circumference, and often the mucous membrane can be made to move over the shelf. In the female, carcinoma of the stomach, being relatively uncommon, is not a frequent cause of shelf formation, and should transcoelomic implantation occur, cancer cells are more likely to alight on the ovaries (*see Krukenberg's Tumours*, p. 234) than to pass into the pouch of Douglas. However, a neoplastic shelf in this position occurs from time to time in late cases of carcinoma of the breast, by a path which is open to question. Any intra-abdominal cancer can be complicated by this condition, and even cancer of the bronchus.

**'Frozen Pelvis'.** Except perhaps posteriorly, the sensation imparted to the examining finger conveys to the mind the impression that all the pelvic viscera are set in a firm-to-hard solid medium, which indeed they are. Often this signifies extensive malignant disease usually originating in the pelvis, although on occasions it can result from pelvic cellulitis or colonic diverticulitis.

**Ballooning of the Rectum** suggests obstruction to the lumen higher up (e.g., at the pelvirectal junction). Once past the anorectal ring, the finger enters a voluminous space, and it has to be bent in this or that direction before the rectal wall is encountered. It is curious that the rectum *below* a constriction should be ballooned; possibly the phenomenon is due to interference with the neuromuscular mechanism. However, the sign is not one of uniform reliability. For instance, a similar condition is found when the rectum is examined immediately after the administration of an enema, as then there still may be air or flatus within the lumen that distends the rectum and keeps the rectal walls distant from the examining finger. It is also seen with some instances of obstruction in the urinary tract and is then, presumably, reflex in origin.

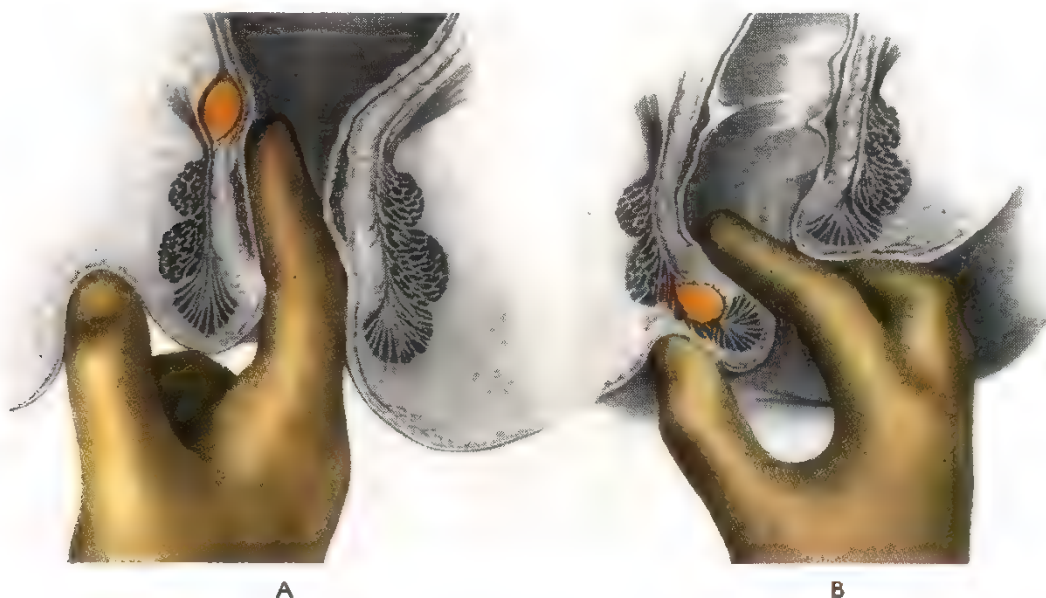


Fig. 534.—A, Palpating a high intermuscular abscess: it is situated above the anorectal ring. B, Method of ascertaining the presence of a low intermuscular abscess—the most common variety of anorectal abscess.

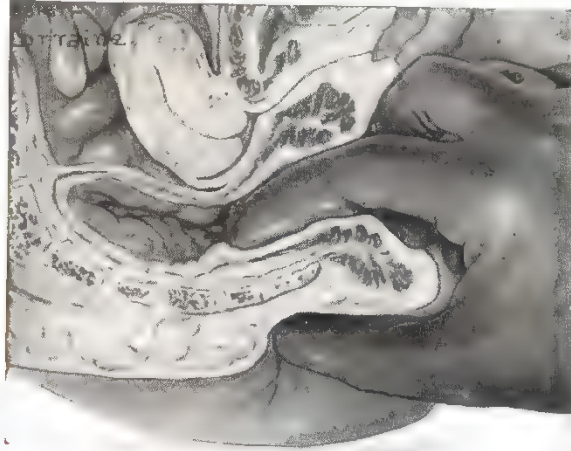


**Anorectal Abscess.**—*High Intermuscular Abscess* (10 per cent) is situated above the anorectal ring. Defaecation is agonizing, and the patient cannot sit in comfort: the temperature is moderately elevated. The diagnosis is made in the early stages by digital examination (*Fig. 534 A*) when an acutely tender, rounded lump is felt above the anorectal junction, generally in the posterior quadrant of the circumference.

*Low Intermuscular Abscess* (80 per cent). The early diagnosis is made as shown in *Fig. 534 B*. Undiagnosed, or treated with antibiotics instead of by early incision, the abscess tracks to the subcutis of the perianal region, or invades the ischioanal fossa.



*Fig. 535.*—Low intermuscular abscess allowed to point externally. Note the surrounding cellulitis.



*Fig. 536.*—Testing the mobility of the coccyx.

*Ischioanal Abscess* (6 per cent) gives rise to a tender brawny induration, palpable in the floor of the ischioanal fossa as well as in the lateral wall of the anal canal of the corresponding side. Constitutional symptoms are severe unless masked by antibiotic therapy. In comparatively early cases there is no redness of the skin. Men are affected more often than women.

*Abscess beneath the Anoderm* (2 per cent) is felt as a tender elevation in the anal canal. It originates in the superficial portion of an anal gland. In the very great majority of the abscesses described above, infection originates in one of the deeper branches of such a gland.

*Abscess beneath the Perianal Skin (Perianal Abscess)* (*Fig. 535*) can arise through neglect of a low intermuscular abscess, or (in the middle line posteriorly) as the result of a sinus extending from a fissure-in-ano, in which case the abscess is situated in juxtaposition to a sentinel pile (*see Fig. 525*, p. 280). The only conditions with which such an anorectal abscess is likely to be confused are an abscess connected with a pilonidal sinus, an abscess of Cowper's gland (*see p. 369*), and an abscess of a Bartholin's gland (*see p. 291*).

*Perianal Cutaneous Amoebiasis* should be borne in mind in the tropics. Spreading ulceration of the perianal skin is found with abscess cavities extending into the ischioanal fossae. The patient is extremely toxic and the granulation tissue lining the ulcers and the abscesses abounds with *Entamoeba histolytica*.

**Examination of a Case of Suspected Coccydynia.**—The index finger is introduced into the rectum in the usual way. It is then rotated so that the coccyx can be grasped between the finger and thumb (*Fig. 536*). Abnormal mobility and tenderness of the coccyx can be ascertained by this manœuvre.



**Massive Oedema of the Rectal Wall** has been noted in volvulus of the pelvic colon. This is due to the inferior mesenteric vein becoming occluded by the torsion.

**Is a Given Lump in the Wall of the Rectum or outside it?**—Sometimes it is a difficult matter to decide whether a particular lump is arising from the wall of the rectum, or if it is outside the rectal wall. Pass the finger to one side of the lump and then slide it over the elevation. In this way one may be able to feel a continuity of the normal mucous membrane and to move the rectal wall on the lump—in which case the lump is outside the rectal wall.

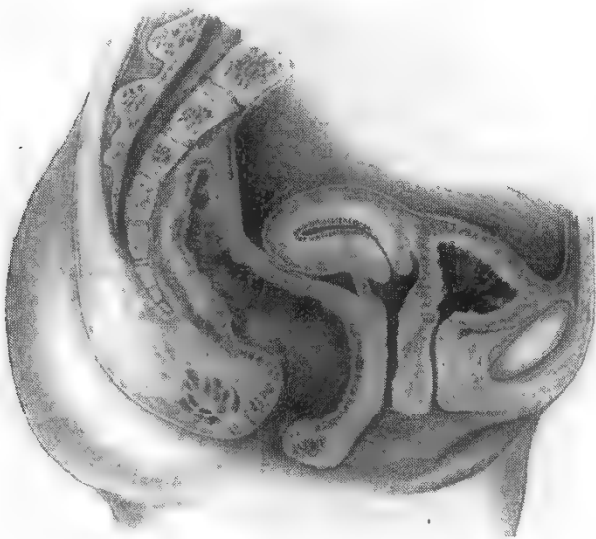


Fig. 537. —Retroverted uterus.

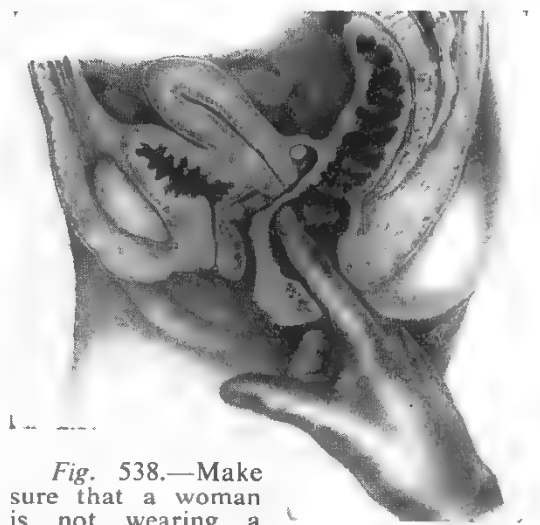


Fig. 538.—Make sure that a woman is not wearing a pessary before expressing an opinion on a lump that can be felt per rectum.

Attention has been directed already to the character of the cervix uteri as felt through the anterior rectal wall. The student must also beware of a larger, domed, firm lump situated a little higher than the cervix uteri. On the downward stroke of the finger it becomes evident that the umbilicated bobbin (the cervix) is not present, or that the domed, firm lump felt previously has taken its place. That the lump is the fundus of a retroverted uterus (Fig. 537) becomes apparent on vaginal examination, for the cervix uteri, instead of pointing downward and backward, points downward and forward.

**A Perplexing, and possibly an Embarrassing, Situation.**—A pessary or a tampon in the vagina can be felt per rectum (Fig. 538). It is astounding how often this seemingly obvious fact proves to be the cause of utter diagnostic confusion.

**Rectal Examination as a Means of palpating the Pelvic Viscera.**—Bimanual recto-abdominal examination is an extremely valuable method of palpating the pelvic viscera. *In the male*, apart from permitting an examination of the prostate and seminal vesicles (see p. 366), its chief use is in deciding if a neoplasm of the bladder is of the infiltrating type (see p. 356). In individuals possessing a sigmoid mesocolon which is long enough to allow the bowel to dangle in the rectovesical pouch, a carcinoma situated near the middle of the pelvic colon or a mass connected with colonic diverticulitis is likely to be accessible. *In the female*, although it may be a little inferior to bimanual vaginal examination, bimanual recto-abdominal palpation is the only means available for palpating the internal organs of generation of female children and *virgines intactae* of more mature years. *In*

*a child* the whole of the pelvic viscera can be palpated with facility. In the female, in addition to the cervix uteri (*see p. 293*), typical, non-tender lumps lying outside the rectal wall that can be felt by digital examination of the rectum are the fundus of a retroverted uterus (*see above*), an ovarian cyst, a subserous fibroid of the uterus, and a swollen Fallopian tube.

By employing this method of examination, the detection of a pelvic abscess occupying the rectovesical pouch (*see Fig. 557, p. 301*) or the pouch of Douglas is rendered a relatively simple matter, while a collection of blood in either of these situations imparts a softly cystic sensation to the examining finger. Both these swellings are tender.

**Bidigital Anovaginal Examination.**—In a comparatively low-lying lesion of the anterior rectal or posterior vaginal wall in parous women much valuable information is obtained either by an index finger in the rectum and a thumb in the vagina, or by inserting the left index finger into the vagina and the right index finger into the rectum.

Fig. 539.—Imperforate anus. High variety.



Fig. 540.—Microscopic anus.



Fig. 541.—Covered anus and vagina.

#### ANORECTAL EXAMINATION IN NEONATES AND INFANTS

**Imperforate Anus.**—One infant in 3000 is born with an imperforate anus. Within an hour of birth, usually it is apparent that there is no anal orifice, or that meconium is being discharged from an abnormal exit. Sometimes these obvious facts are overlooked for two or three days, by which time the infant is in the throes of intestinal obstruction.

**High Variety (Rectal Agenesis) (Fig. 539).**—The rectum ends blindly well up in the pelvis 2 cm. or more proximal to the anal dimple. To settle the important question as to whether the case before us belongs to this category, or to one of the

less serious varieties, while the child cries, the perineum must be watched, palpated, and, if necessary, probed. In the male the external urinary meatus and the urine are inspected for meconium (recto-urethral fistula). In the female the labia are separated with a view to finding a vaginal discharge of meconium or an imperforate hymen bulging with dark meconium behind it (rectovaginal fistula).

*A Simple Septum* is rare. If the anal dimple bulges when the child cries, and particularly if the anal membrane is dark because of meconium abutting against it, it is certain that the case is one of a simple septum.

*Microscopic Anus* is so minute (Fig. 540) that only an occasional speck of meconium reveals its presence ('fly speck'—Browne).

*Stenosis at the Junction of the Hind-gut with the Proctoderm* is discovered only by rectal examination.

*Vaginal Ectopic Anus*.—The anus opens by a comparatively small hole into the vagina, so that faeces are passed per vaginam. Usually the opening is in the lower third. 'Shot-gun' perineum is merely a variation of the normal in which the anus and vagina lie much closer together than usual.

*Covered Female Anus* (Fig. 541) results from excessive fusion of the genital folds.

*Covered Male Anus*.—No anal orifice can be seen, but there is a thin blue line running forward from the anal dimple. The orifice of this subcutaneous sinus discharges meconium on to the perineum.

**Examination of the Rectum of a Neonate.**—The little finger should always be employed for this purpose as the index finger is too large and may inflict damage. In Fig. 542 the little finger has entered the anus of an infant a few days old, and the findings are those of Hirschsprung's disease (see p. 248).

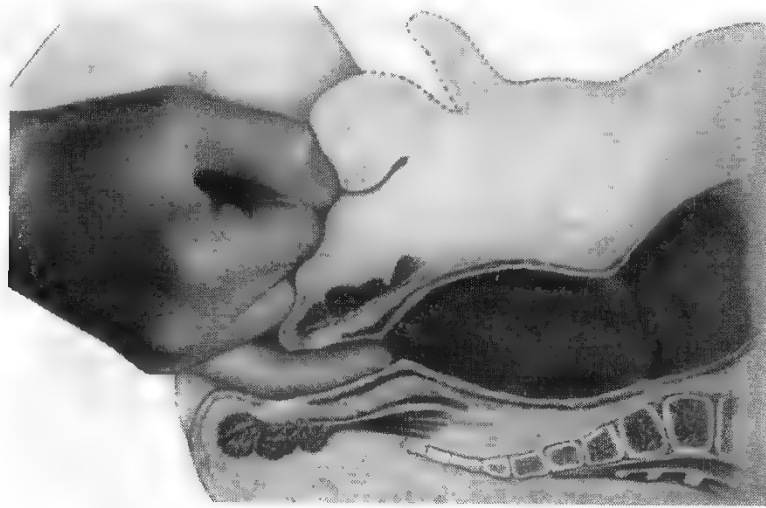


Fig. 542.—Rectal examination in a neonate, employing the little finger. Case of Hirschsprung's disease.

**Rectal Examination in Infancy.**—After the age of three months (retarded premature infants excepted) the infant's anus can be entered by the index finger, and because of the relatively small size of the pelvis an astoundingly wide vista lies within range, and even structures in the lower half of the abdominal cavity can be palpated. Rectal examination under two years of age rarely, if ever, is

of any help in elucidating tenderness because of crying, and serves only in the identification of a palpable lump.

*Intussusception* (see p. 313).

### VAGINAL EXAMINATION

'Never insult the vagina by examining the rectum first' is an old axiom, which can be retained provided it does not convey to the clinician the impression that, having completed a vaginal examination, he is entitled to proceed with a rectal examination using the same glove without even cleansing it. Some infections, including gonorrhoea, are conveyed from the vagina to the rectum in this manner. Actually it is immaterial which of these examinations is done first; the important point is to *change the glove*.

Vaginal examination is dealt with so thoroughly by the gynaecological department that only a comparatively brief reference to this important method will be made. Vaginal examination as it concerns clinical surgery is portrayed here.

**Position.**—In the consulting room the left lateral position (see p. 275) is usually utilized. If it is desired to scrutinize the urethral orifice the dorsal position (see p. 275) is better. In gynaecological practice it is wise to re-examine the patient bimanually in the lithotomy position after the bladder has been emptied with a catheter, before embarking on an operation. This examination is conveniently carried out under anaesthesia.

**Technique.** The hands are washed thoroughly. The right hand should be gloved and its index and middle fingers lubricated. After inspecting the external genitalia, the labia are separated by the thumb and the forefinger of the left hand. The index finger is introduced into the vagina, followed, in women who have borne children, by the middle finger. First the cervix is located, and its characteristics are noted. The anterior, posterior, and lateral fornices are palpated in turn.

**The Female Urethra** is discussed on p. 356.

**The Vulva.**—All those lesions that are found on the penis (see pp. 363, 385) —a primary chancre, the primary lesion of lymphogranuloma inguinale, granuloma inguinale, chancroid, herpes, leucoplakia, and carcinoma —also occur on the labia or the margin of the introitus. Papillomata acuminata are often more luxuriant than those occurring on the penis, and in Africans they sometimes assume enormous proportions. A sebaceous cyst (or cysts) is relatively common.

Pruritus vulvae produces the same symptoms and effects on the labia as pruritus ani does on the anus. The investigations are similar to those of that condition (see p. 283) bearing in mind that a vaginal discharge (see below) is often the cause.

The following conditions are analogous with imperforate anus but are unlikely to be detected in infancy as they are symptomless:—

*Absent Vagina: Imperforate Hymen* (see p. 292): *Adherent Labia Minora*—non-separation of the labia mimics the first two and in practice is commoner than both combined.

**Palpation of Bartholin's (Greater Vestibular) Glands.**—While a fully formed abscess of a Bartholin's gland is obvious (Fig. 543), nevertheless, considerable enlargements of this gland (due, usually, to a retention cyst, but rarely to an adenocarcinoma) can be missed unless they are searched for correctly. Palpate the posterior part of the labia majora between the finger and thumb (Fig. 544). The gland lies more deeply and more posteriorly than one would expect.

*The Vaginal Outlet* (the introitus) is inspected and the presence or absence of the hymen is noted. The virginal hymen has a small sharp-edged opening that usually admits only the finger-tip, but sometimes allows one finger to enter. In rare instances the hymen is imperforate, and after puberty it is seen to be bulging and purple from retained blood behind it. A slight bluish tinge of the introitus suggests early pregnancy.



Fig. 543.—Abscess of the left Bartholin's gland.



Fig. 544.—Method of palpating Bartholin's gland.

*A Vaginal Discharge* is more likely to be present in patients with a roomy introitus than those with an intact hymen. Normally a variable amount of white curdy mucus is found. A blood-stained discharge can be due to menstruation, an impending or recent abortion, an ectopic pregnancy, or to uterine carcinoma. A profuse whitish or purulent discharge denotes salpingitis, endometritis, cervicitis or, most commonly, vaginitis. *Trichomonas vaginalis* infestation causes a profuse watery pale yellow, sometimes frothy, discharge with intense pruritus. Especially in a *virgo intacta*, thrush (*candida albicans*) leads to a thick cheesy discharge which is particularly excoriating. In gonorrhoea the discharge is frankly purulent.

*Testing the Supporting Musculature.*—At this juncture, ask the patient with an ample introitus to 'strain down'. In this way, if present, a *cystocele* (descent of the bladder through the anterior vaginal musculature (Fig. 545)) or a *rectocele* (descent of the rectum through the posterior vaginal musculature) becomes apparent. In the case of the latter, the musculature of the perineum is tested by bidigital anovaginal examination (see p. 289). In cases where the pelvic diaphragm and the ligaments supporting the uterus are defective, as a result of straining, the cervix appears at the introitus and becomes extruded for a varying distance (*procidentia*).



Unless it is known that the bladder is empty, ask the patient to cough several times. When the sphincter urethrae is not fully competent, urine will be spilled from the bladder by these expulsive efforts (*stress incontinence*) (see also p. 357).

**Bimanual Palpation.\***—The lubricated finger or fingers of the right hand are passed into, and are kept high in the vagina, while the left hand presses downwards and backwards above the pubic symphysis (Fig. 546). The size and other characteristics of the uterus can be ascertained by this method. In particular a decision should be reached at the outset of the examination whether it is in its normal anteverted position or is retroverted (see Fig. 537). Normal ovaries may be felt in a thin patient. Normal uterine (Fallopian) tubes are not palpable. The size and other characteristics of a pelvic swelling, whether or not it is attached to the uterus (Fig. 547), whether it is cystic or solid, fixed or free, regular or irregular, can be ascertained by skilful bimanual palpation.

In general, resistance or swelling anterior to the cervix denotes an affection of the bladder or pelvic connective tissue, while posteriorly anything abnormal is in the pouch of Douglas.

**The Cervix.**—While a torn cervix or the gross irregularity produced by an established carcinoma of the cervix can be detected by digital examination,

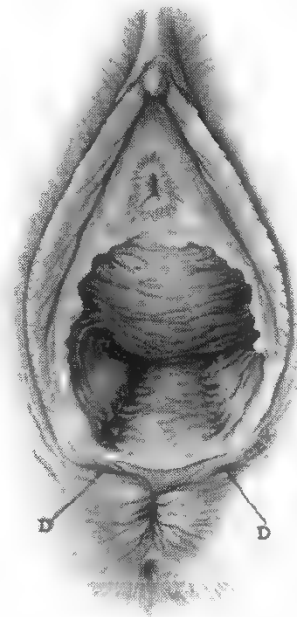


Fig. 545.—Cystocele caused by a bygone birth injury. There is also an inconspicuous rectocele, but the entire perineal body has been torn through and the dimples (D) mark the ends of the separated sphincter ani.

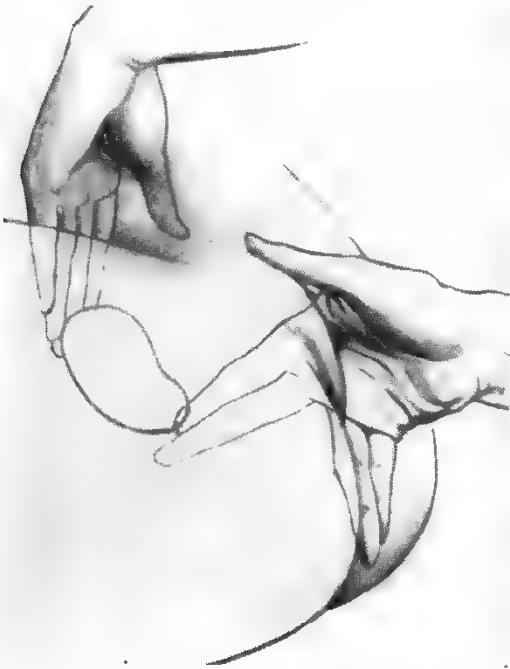


Fig. 546.—Bimanual palpation of the uterus which is anteverted. (After Martin.)



Fig. 547.—The bimanual findings in a case of a solitary fibromyoma of the uterus.

\* Bimanual palpation of the pelvis was introduced by Puzos in the eighteenth century.

it would be idle to dwell on these findings when the cervix is displayed so readily to direct inspection by the passage of a speculum—a procedure that is beyond the scope of this work.

**Fibromyoma (Fibroid).**—The characteristic findings are a painless, insensitive enlargement of the uterus which is nodular, hard, and movable. Usually fibromyomata are multiple and vary in size; sometimes one or more is immense. A solitary fibromyoma (*Fig. 547*) which has degenerated and become soft and perhaps cystic is often very difficult to distinguish from normal pregnancy or an ovarian cyst.

**Ovarian Cyst** is usually unilateral, and may become so large as to fill the abdomen, when the differential diagnosis must be made from ascites (*see p. 251*). In the ordinary course of events the cyst is distinguished from other swellings by its rotundity and free mobility. In the case of a large cyst, a second small cyst is often found at operation on the opposite side. It is unusual to be able to make a clinical diagnosis of bilateral ovarian cysts and, indeed, the distinction is academic.

**Endometriosis** is more difficult to diagnose. The patient is usually between 25 and 40 years of age. The characteristic findings are in the adnexae. The ovaries are enlarged, fixed, and at least somewhat tender. The uterus may be slightly enlarged by the disease. When right-sided, the condition is occasionally mistaken for an appendix abscess. Endometriosis also occurs rarely in the wall of the bladder and the rectosigmoid, when it gives rise to signs of neoplasm of those organs.

#### **Carcinoma of the Uterus.—**

*Carcinoma of the Corpus Uteri.* In most parts of the world carcinoma of the body of the uterus is less common than that of the cervix. It tends to occur after the menopause and is thus a common cause of postmenopausal bleeding.

While carcinoma of the cervix soon produces a foul discharge, in carcinoma of the body of the uterus usually the discharge remains non-odorous and sero-sanguineous. The uterus is inclined to be bulky, but in early cases there are no pathognomonic signs on bimanual palpation. The diagnosis rests on microscopical examination of the products of curettage.

*Carcinoma of the Cervix Uteri* occurs commonly before the menopause. Post-coital bleeding is suggestive. The most important signs are that vaginal examination invokes bleeding, and there is induration and irregularity of the cervix. Later, parametrial invasion gives a characteristic feel as though the cervix were embedded in plaster-of-Paris.

**Vaginal Examination in Acute Abdominal Conditions** (*see pp. 326–7*).

**Venereal Disease** (*see p. 384*).

## CHAPTER XXII

## ACUTE ABDOMINAL CONDITIONS

*'Happy is he who has no serious consequences of his erroneous diagnosis to regret.'*—  
Marsh.

PHYSICAL signs and their interpretation reach a high pinnacle of importance in the diagnosis of acute abdominal disease. Frequently an urgent and all-important decision has to be reached by their aid alone. It is for this reason that no section of this book rivals this in responsibility. Descriptions of the methods of taking the history in varying circumstances, and the vast amount of helpful information that frequently is garnered thereby, are beyond the scope of this book. At this point it should be stressed that in cases of doubt, which are numerous, repeated examination at hourly intervals often solves the problem.

Radiographs are helpful in many instances but are of no value unless there is a sufficient degree of intestinal obstruction to produce contrasting collections of gas and fluid in loops of bowel on taking a film with the patient in the erect position (fluid levels), or sufficient free gas in the peritoneal cavity to show up as a translucency under the diaphragm. In many inflammatory conditions such radiographic abnormalities are only seen at a late stage. On the other hand in infancy an abdominal radiograph is often essential for reasonably early diagnosis of intestinal obstruction.

## PRELIMINARY INFORMATION

Before embarking on the method of eliciting, and the interpretation of, physical signs connected with individual acute intraperitoneal lesions, some signs applicable to any intraperitoneal inflammatory condition, and especially to one in which the parietal peritoneum is implicated, will be explained.

When called upon to examine the abdomen of a patient who has been placed in the sitting posture, unless there is some contra-indication, have him placed, for the time being, flat, with one pillow beneath his head. It is impossible to examine the abdomen thoroughly unless the patient is recumbent.

**Is the Abdominal Rigidity Involuntary or Voluntary?—**

*Voluntary* contraction of the abdominal musculature (due to fear, resentment at being examined, exposure of the naked abdomen to a cold atmosphere, or laying on of a hand less warm than the patient's skin) has to be distinguished from:—

*Involuntary* reflex rigidity due to inflammation of the peritoneum.

Patience in the examination of the patient (usually a child) together with experience and perhaps repeated examination can enable differentiation. Even so, the most experienced of clinicians make mistakes. If there is doubt the wise practitioner has the patient admitted to hospital where a rising pulse-rate over a period of several hours indicates the necessity for laparotomy.

In deciding the momentous question, 'Is this an acute abdominal condition?' there are four signs that may prove helpful in a general way:—

**The Pointing Test.**—Ask the patient to point to the site of the pain. If this

proves to be the site of localized tenderness it is also almost certainly the site of the diseased viscus. An important application is in acute appendicitis.

**Altered Abdominothoracic Rhythm.**—Normally, during inspiration, the abdomen comes out with the chest. If, however, when the chest comes out the abdomen remains still, it is highly probable that general peritonitis is imminent. The first three or four respirations must be disregarded in order to allow the patient to overcome his self-consciousness (Jeans).

**The Cough Test.**—Ask the patient to cough. If pain is felt in the upper abdomen it suggests an inflammatory process either above the diaphragm (i.e., pleurisy or pneumonia) or in the upper abdomen.

**Rebound Tenderness (Blumberg's Sign).**—Having palpated the desired area as deeply as circumstances allow, the palpating hand is withdrawn suddenly and completely. As a result of this abrupt removal of the pressure that was applied slowly and gently, but with increasing firmness, the stretched abdominal musculature springs back into place, viz. —————→ carrying with it attached peritoneum which, if inflamed, causes the patient to wince, or in many instances to cry out in pain (Fig. 548). This sign is employed directly over any part of the abdomen suspected of harbouring an inflamed focus when there is *doubt* about the presence of early peritonitis. *It is quite unnecessary with undoubted involuntary rigidity.*



Blumberg himself pressed in the *left* iliac fossa, and if the patient complained of pain in the lower abdomen (he did not specify any particular part of the lower abdomen) he concluded that his provisional diagnosis of acute appendicitis was confirmed.



A



B

Fig. 548.—A, Exert deep pressure at the site of pain. B, Remove the hand suddenly. If the test is positive the patient winces or cries out.

### ACUTE APPENDICITIS

Should the student feel that undue prominence is given here to the diagnosis of this condition he is reminded that, in most parts of the world, it is the commonest cause of the 'acute abdomen'.

Take the pulse and temperature. These show but little alteration in the early stages. Usually an acceleration of the pulse-rate signifies the onset of peritonitis.

The pain of acute appendicitis rarely commences in the right iliac fossa. Ask the patient where the pain *began*: usually he places a finger near the umbilicus (Fig. 549 A). Now ask where the pain is *now*; the pointing finger passes to the right iliac fossa (Fig. 549 B). The pointing test, when positive, is of the greatest possible diagnostic significance.

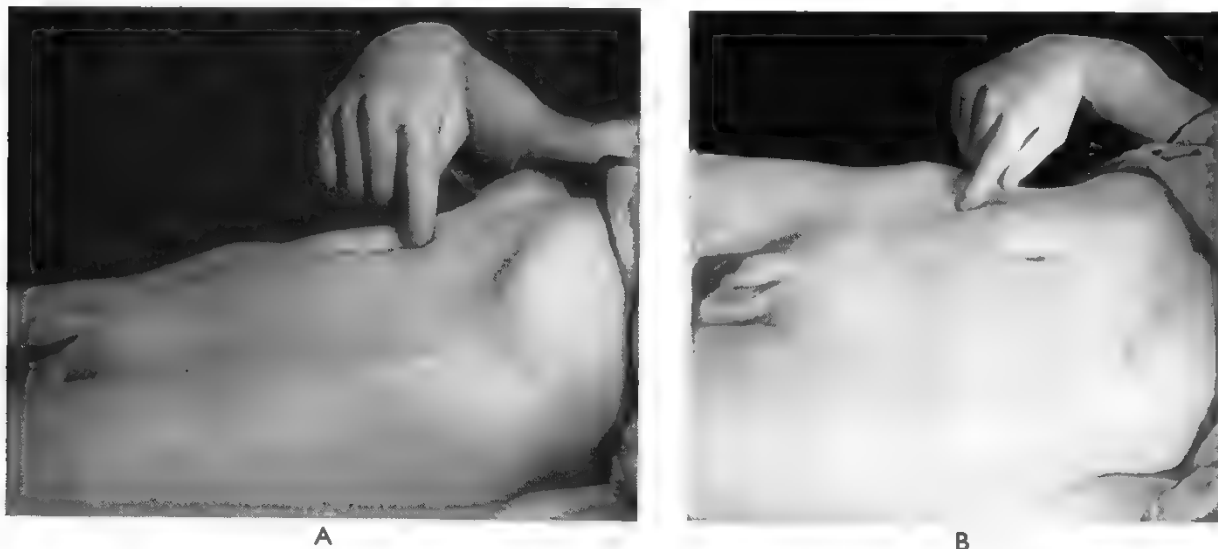


Fig. 549.—The pointing test in appendicitis. A, The answer to the question 'Where did the pain begin?'—He is pointing to the umbilicus.\* B, The answer to the question, 'Where is the pain now?'

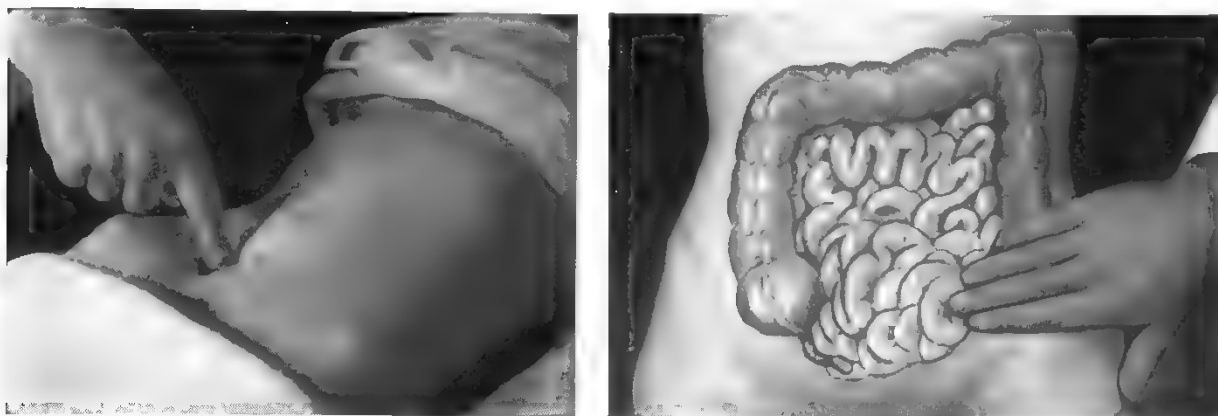


Fig. 550.—Finger-tip pressure over McBurney's point.

Fig. 551.—Rovsing's sign. Pressure on the left iliac fossa produces pain in the right iliac fossa when the sign is positive.

**Inspection.**—Unless an acutely inflamed obstructed appendix has perforated, and diffusing peritonitis has ensued, no alteration in the contour of the abdomen and no alteration in the abdominal movements of respiration can be expected.

**Palpation.**—Commence palpation diagonally opposite the point where pain is or was experienced, viz., lay the hand upon the left hypochondrium. Next palpate the right hypochondrium, then the left iliac fossa, leaving the right iliac fossa until last. In typical cases localized rigidity and tenderness can be demonstrated

\* Pain evoked by high intraluminal pressure in any part of the midgut is referred to the umbilicus. Wilkie showed that acute appendicitis is commonly obstructive in type, the obstruction being due to a faecolith blocking the lumen.

SIR DAVID WILKIE, 1882–1938, *Professor of Surgery, University of Edinburgh.*

CHARLES MCBURNEY, 1845–1913, *Surgeon, Roosevelt Hospital, New York. Described a point 'very exactly between an inch and a half and two inches from the anterior superior spinous process of the ilium on a straight line drawn from that process to the umbilicus'.*

THORKILD ROVSING, 1862–1937, *Professor of Surgery, Copenhagen.*

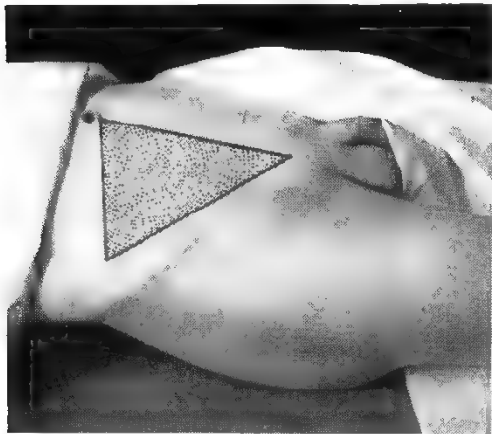


in the right iliac fossa so convincingly that no doubt remains in the mind of the clinician as to their presence. *This is the most important point in the diagnosis of acute appendicitis: all other signs are subsidiary.*

**Rebound Tenderness.**—In many instances a small area in the right iliac fossa is more tender than the remainder.

When the diagnosis is still in doubt three further physical signs can be sought:—

**McBurney's Sign.**—Finger-tip pressure is made over McBurney's point (*Fig. 550*), which, if the sign is positive, registers the maximum abdominal tenderness. This sign is sometimes useful in very early or subacute cases of appendicitis.

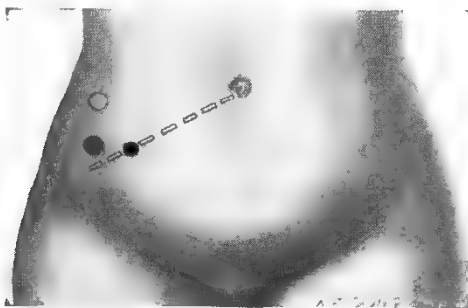


*Fig. 552.*—Sherren's skin triangle of hyperaesthesia for appendicitis, formed by: (1) The highest point of the iliac crest; (2) The right pubic tubercle; (3) The umbilicus. The exact area often varies.

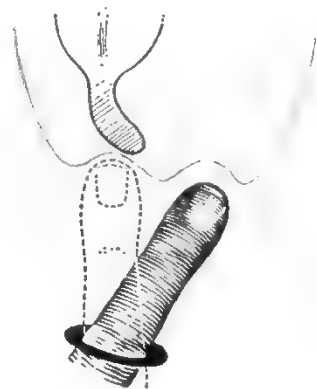
**Rovsing's Sign.**—Even pressure is exerted over the descending colon. If, when the left iliac fossa is pressed, pain is appreciated in the right iliac fossa, the case is probably one of acute appendicitis. This sign appears to be due to the shift of coils of ileum to the right impinging on an inflamed focus in the right iliac fossa (*Fig. 551*). When taken into consideration with other evidence, a positive Rovsing's sign is contributory evidence of acute appendicitis.

**Cutaneous Hyperaesthesia.**—Take a pin and pass its point vertically down the *left* lower half of the abdominal wall, exerting very slight but even pressure. Again, pass the pin down the *left* side a little more medially, but parallel to the first line. Proceed in the same manner on the *right* side. If hyperaesthesia is present, the patient will experience pain when the pin reaches the hyperaesthetic area (*Fig. 552*). There is no need to ask the patient any questions; one can discern at once the onset of pain by the facial expression. Hyperaesthesia signifies that the inflamed appendix is, as yet, unperforated; when perforation occurs it passes off.

**Signs in Retrocaecal Appendicitis.**—The organ may be entirely retroperitoneal. Rigidity is inclined to be ill-defined anteriorly, but sometimes it is present in the lateral or posterior aspect of the abdominal wall. It therefore behoves the clinician not to confine his attention to the front of the abdomen, but to pay equal attention



*Fig. 553.*—*Black:* McBurney's point. *Red:* Point of maximum tenderness in retrocaecal appendicitis. *Green:* In cases of maldescent of the caecum, this point may be as high as the level of the umbilicus.



*Fig. 554.*—Differential rectal palpation.

to the right flank and the posterior aspect of the abdominal wall, as far as the lateral border of the sacrospinalis muscle. To carry out the examination, the patient must be instructed to roll towards the left side. Tenderness, as opposed to rigidity, will,

in many instances, be most in evidence just medial to the anterior superior iliac spine (*Fig. 553*). In cases of high retrocaecal appendicitis the seat of greatest tenderness is in the same plane, but higher—even as high as the level of the umbilicus.

**Rectal Examination** is an essential part of the examination of every patient with suspected appendicitis. The technique is detailed in Chapter XXI. Proceed as follows: Palpate the left side of the rectovesical pouch or, in the female, the pouch of Douglas; then palpate the right side (*Fig. 554*). If there is any doubt as to the relative tenderness, repeat the process, at the same time asking the patient, 'Is there any difference in the two sides?' In early cases of pelvic appendicitis the discovery of tenderness on the right is often the crucial factor in an all-important diagnosis. In later cases the finding of a tender lump or cystic swelling (pelvic abscess), when perhaps there are few signs on abdominal examination, brings home the indispensable necessity for making a rectal examination.

**Atypical Acute Appendicitis** is the most difficult of all intra-abdominal emergencies to diagnose. About one out of four cases is atypical. This high proportion is due to: (i) the variability in the length of the appendix (sometimes the terminal portion alone is diseased); (ii) the inconstant position of the organ; (iii) the fact that the disease can occur in infants, the aged, and in pregnant women.

For the real case of doubt and difficulty there are yet two signs that sometimes prove helpful, for they disclose the presence of an inflamed deeply placed appendix lying in contact with the psoas or the obturator muscle respectively.

**The Psoas Test.**—When an inflamed focus lies in contact with the psoas muscle, to relieve the pain the patient often flexes the corresponding thigh. A lesser degree of psoas spasm is ascertained in the following way: With the patient lying on the left side, *hyperextend* the right hip-joint. If the psoas muscle is in a state of irritation, this manœuvre causes pain.

**The Obturator Test.**—Flex the right thigh, rotate the hip-joint internally. This puts the obturator internus on the stretch. An inflamed appendix in contact with and adherent to this muscle will be irritated by this movement; pain will be experienced in the hypogastrium (Cope).

**Acute Appendicitis during Pregnancy.**—The enlarging uterus causes upward displacement of the caecum thus rendering the pain higher and more lateral than usual, and the area of maximum tenderness is not only displaced likewise, but protected by the uterus and more difficult to demonstrate.

**Shifting Tenderness.**—Having located the most tender spot, mark it on the skin. Now request the patient to turn on the left side and wait for a full minute. Should the tenderness be uterine in origin (concealed accidental haemorrhage; necrobiosis of a uterine fibroid) it will shift with the uterus, whereas in appendicitis the position will remain constant (Alders).

**Acute Appendicitis in the Elderly.**—In those who have a lax abdominal wall, or those with an overwhelming toxic infection, rigidity is often very slight or even absent. The peculiar danger in the aged is that an atherosclerotic appendicular artery probably favours rapid gangrene of an inflamed obstructed appendix. The combined effect of senile muscular atonia and of distension due to peritonitis is that intestinal obstruction is diagnosed, an enema is given, the bowels may act as a result, and further delay results because the clinician concludes that there is an incomplete intestinal obstruction.

While this train of events is commonplace, acute-on-chronic intestinal obstruction due to carcinoma coli is also frequent at this time of life and in these cases the brunt of the obstruction is often borne by the caecum (*see p. 310*). Therefore,

JAMES DOUGLAS, 1675–1742. 'Man-midwife' who practised in London. Physician to Queen Caroline, wife of George II.

SIR ZACHARY COPE, *Contemporary Surgeon Emeritus, St. Mary's Hospital, London.*

NICHOLAS ALDERS, *Contemporary Honorary Obstetrician and Gynaecologist, Bournemouth and E. Dorset Hospital Group.*

palpate the whole course of the colon and explore the rectum digitally for the presence of a lump (a carcinoma). Do not advise the administration of an enema unless certain that peritonitis as the cause of the distension has been eliminated.

**Acute Appendicitis in Infancy and Childhood.—**

*a. In Infancy.*—Certain vagaries of the clinical picture occur, the four earliest signs at this time of life being pyrexia, abdominal pain, vomiting, and local tenderness. Any of these may predominate, any may be absent, any may be associated with another which is uncommon in the early stage in older patients, namely, diarrhoea (Bunton). In a baby the temperature rises precipitously with the onset of an infection, and early considerable pyrexia is present in over 50 per cent of cases. The administration of an antibiotic masks the pyrexia and the increased pulse-rate more quickly and more certainly than in those of more mature years. Screaming attacks of abdominal pain are usual and call for examination (often repeated examinations) of the abdomen beneath the bedclothes (*see Fig. 565, p. 313*) during the intervals. Always entertain the *possibility* of acute appendicitis *together with* a respiratory infection, gastro-enteritis, or one of the exanthemata.



*Fig. 555.*—Palpating the abdomen with the child's own hand.

*b. In Childhood.*—Screaming children, too young to co-operate in the search for physical signs, sometimes can be placated by the following expedient. The abdomen is palpated with the child's own hand (*Fig. 555*). When the point of maximum tenderness is approached, the child pulls its hand away, and commences crying. This simple method, if carried out patiently, will often succeed in elucidating the area of maximum tenderness when other methods are inconclusive (Grainger). If there is doubt even after this, sedate the child and re-examine when he has fallen asleep. If there is an area of local tenderness due to peritonitis assuredly the child will wake when this area is palpated.

**THE DIFFERENTIAL DIAGNOSIS OF ACUTE APPENDICITIS**

*'If vomiting or distinct nausea precedes pain, the case is not one of appendicitis.'*—

*Murphy.*

Manifestly it is impossible here to enter at length into this subject, and it must suffice to urge the examiner always to examine the right lung and the right kidney and

the pelvic organs in the female. In children consider non-specific mesenteric adenitis (*see* p. 323).

**The Right Lung.**—The differentiation between referred abdominal pain attending the diaphragmatic inflammation of pleuro-pneumonia and peritonitis is a highly responsible one, for obviously to administer an anaesthetic to a patient with pneumonia is, to say the least, undesirable. Such pain can be accompanied by some rigidity, but the absence of rebound tenderness will demonstrate that the peritoneum is not tender, therefore not inflamed, and therefore not the primary source of the abdominal pain. A patient with abdominal pain, not obviously colicky (*see* p. 308) and unaccompanied by tenderness, anywhere in the abdomen, or by tenderness within the pelvis as elicited by rectal examination, can, with confidence, be kept under observation for two or three hours without fear that an urgent surgical emergency is being overlooked.

**The Thoracic Compression Test.**—When it is difficult to decide whether a young child has acute appendicitis or basal lung involvement, compression of the lower thorax from side to side elicits obvious distress when the lesion is above the diaphragm, whereas in appendicitis it has no effect (Dott).

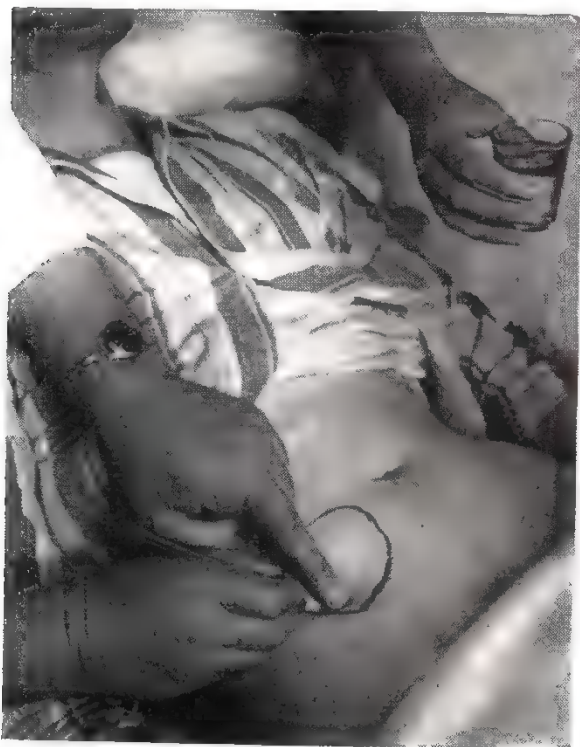


Fig. 556.—Appendix abscess. Method of marking out the periphery of the lump with a skin pencil.



Fig. 557.—The rectal findings in an appendix abscess invading the pelvis.

**The Right Kidney and Ureter.**—Perhaps the most confusing differential diagnosis is between acute appendicitis and ureteric colic resulting from a stone in the right ureter (*see* p. 349). To remove a normal appendix of a patient who is suffering from a stone in the right ureter is disconcerting, but relatively harmless. To reverse the mistake, and attribute the pain of an acutely inflamed appendix lying in contact with the right ureter to 'pyelitis' or to ureteric colic is an extremely serious error. Unless the clinician has been instructed especially to be alert concerning this possibility, woe betide a patient who has blood or pus cells in the urine because of

ureteritis secondary to an inflamed appendix lying in contact with the right ureter. *If a diagnosis of stone in the ureter cannot be confirmed by radiography it is safer to remove the appendix.*

**The Pelvic Organs in the Female.**—*Acute Salpingitis*, although still a condition requiring diagnostic vigilance when accounting for pelvic peritonitis in women of child-bearing age, is less frequently encountered than formerly. This is due to the greatly improved control of gonorrhoea by antibiotics. As emphasized on p. 327, tenderness in salpingitis is commonly bilateral.

Other conditions peculiar to women also liable to be mistaken for appendicitis are ruptured lutein cyst (*see* p. 326), ruptured ectopic gestation (*see* p. 325), and twisted right ovarian cyst (*see* p. 326). All these require surgical treatment and, particularly in women, if there is doubt about the diagnosis, an operation incision should be utilized which is capable of extension to deal with a pelvic abnormality if necessary.

#### APPENDIX MASS

Palpate the lump gently. It is very helpful to mark out the limits of the mass with a skin pencil. This is essential if the case is going to be treated conservatively. The general signs are watched by keeping an hourly-pulse and 4-hourly temperature-chart. The local signs can be kept under observation by noting the increase or decrease of the limits of the lump (*Fig. 556*).

**Pelvic Appendix Mass.**—Rectal examination is essential to ascertain whether the abscess is invading the pelvis (*Fig. 557*). It should be noted that acute diarrhoea, accompanied by the passage of mucus, in a patient who has not had dysentery or ulcerative colitis, is proof positive of a pelvic abscess.

**Post-appendicectomy Pyrexia.**—One is called to see a patient some days or even weeks after an operation for acute appendicitis or appendix mass (or, for that matter, any other abdominal operation) because his condition is unsatisfactory; the temperature is swinging and the pulse is elevated—signs that foretell the pocketing of pus. The clinical investigation of such a case is carried out as follows:—

1. Examine the wound and the adjacent abdominal wall for an abscess thereof.
2. Consider the possibility of a pelvic abscess (*see above*).
3. Palpate the left iliac fossa for an abscess in this situation.
4. Examine the loin for a perinephric abscess (*see* p. 353).
5. Look at the legs to exclude the possibility of phlebitis.
6. Examine the sclerae for an icteric tinge and the liver for enlargement. Also inquire if the patient has had rigors—signs that denote pylephlebitis.
7. Examine the lungs—pneumonia, atelectasis, or pulmonary embolus (*see* pp. 196–9).
8. Examine the urine for pus (pyelonephritis) and, in the tropics, the faeces for blood and pus (dysentery). In the tropics examine the blood for malaria parasites.
9. Lastly, concentrate diagnostic endeavour upon the possibility of a sub-diaphragmatic abscess (*see* p. 321).

#### ACUTE COLONIC DIVERTICULITIS

Ninety-five per cent of colonic diverticula giving rise to symptoms are situated in the pelvic colon.



**Uncomplicated Acute Diverticulitis.**—In typical cases the pain commences in the hypogastrium and passes to the *left* iliac fossa, where the maximum tenderness is situated. This makes the differential diagnosis from appendicitis simple. Nevertheless, acute diverticulitis presents itself in many guises. For instance, when an inflamed diverticulum is situated in a loop of colon lying in the pelvis, tenderness is elicited mainly by pelvic examination, and the differentiation between acute pelvic appendicitis and acute diverticulitis is not apparent until laparotomy has been performed.

**Acute Free Perforation** of an inflamed colonic diverticulum is not uncommon. The signs are those of a very rapid, diffusing peritonitis, and most of the patients have no premonitory symptoms of colonic diverticulitis.

**Localized Peridiverticular Abscess** is a common complication of acute diverticulitis. When an inflamed diverticulum situated within the mesocolon bursts, the pus will be confined, at any rate for some time, between the layers of the mesocolon. In these circumstances the mesocolon becomes greatly thickened, the bowel angulated, and oedema resulting from pressure on lymphatics and blood-vessels is liable to result in incomplete intestinal obstruction. When a slow perforation of a diverticulum is not thus confined, it gives rise to a peridiverticular abscess walled in by greater omentum and coils of small intestine. In these circumstances sometimes a tender mass can be palpated in the left iliac fossa; at others it is obscured by overlying rigidity but the rebound sign (*see* p. 296) is positive.



*Fig. 558.*—Watching for abdominal movement on respiration. The patient is placed between the light and the examiner. In this instance retraction of the epigastrium is apparent.

### PERFORATED PEPTIC ULCER

**Pulse.** —*For the first six hours the pulse-rate is often practically unaltered.* The gravity of the prognosis varies directly with the pulse-rate; the great majority of patients diagnosed and treated correctly while the pulse is still under 100 beats per minute recover, while many of those in whom treatment is delayed until their pulse-rate rises to 120 or more, die.

**Temperature.** —The temperature is likely to be subnormal owing to shock. There are but few exceptions to this rule.

**Inspection.**—*Retraction of the Epigastrium.* In an early case, especially if the subject is a spare, muscular man, this is a characteristic sign (*Fig. 558*). If

well-marked, when viewed laterally, the appearance is as if an invisible rope was constricting the abdomen at the level indicated in *Fig. 558* (inset) due to muscular contraction of the diaphragm and anterior abdominal wall (Willan). As time passes this sign is lost.

Carefully inspect the abdomen for respiratory movement. The patient should be placed between the light and the examiner. In perforated ulcer the abdominal muscles are held so rigidly that respiration is almost entirely of the thoracic type. The respirations are often of a peculiar grunting character, and altered abdomino-thoracic rhythm, already referred to (*see p. 295*), may be noted.

'*Point to the place where it hurts you now.*' Often the patient indicates that the whole abdomen is painful.

'*Point to the place where the pain started.*' Quite frequently there is a finger pointing to the epigastrium.

**Palpation.**—The abdomen is now palpated systematically, commencing in the left iliac fossa. *Board-like rigidity* is characteristic, and the cardinal sign of the condition. With the onset of diffusing peritonitis and consequent distension, rigidity (and to a great extent the agonizing pain) passes off to a varying degree.

**Percussion.**—The absence of liver dullness in the mid-axillary line is very fair evidence of gas in the peritoneal cavity. As a rule it is only in late cases of perforation that sufficient gas collects to give a tympanitic note. However, when sought for carefully, this sign proves helpful in making the diagnosis.

It is possible to be deceived by overlying emphysema of the lung. If in doubt on clinical grounds (which is unusual) a radiograph with the patient erect will confirm a crescent of translucency beneath the right cupola of the diaphragm.

**Rectal Examination.** When the patient is in great pain, rectal examination should be undertaken in the dorsal position. Sometimes tenderness can be detected in the rectovesical pouch (*see Fig. 557*).

**Reflexes.** The examination should be concluded by testing the knee-jerks and the reaction of the pupils to light if definite rigidity is absent. If this is not done, sooner or later a *gastric crisis of tabes dorsalis* will be confounded with a perforation. On the other hand, it must be realized that perforated peptic ulcer is now commoner than a crisis in patients with *tabes dorsalis*.

**Perforated Gastric Ulcer.**—The diagnosis is seldom really difficult. Diaphragmatic pleurisy and coronary thrombosis (*see p. 327*) are the conditions with which it is most likely to be confused. The clinician who is unaware of the three entities mentioned under the heading of Abdominal Aortic Catastrophes on p. 328 is likely to mistake these, admittedly uncommon conditions, for a perforated gastric ulcer.

**Special Features of Perforated Duodenal Ulcer.**—Perforated duodenal ulcer is considerably more common than perforated gastric ulcer, and while, as a rule, the physical signs to which each gives rise are identical, in the case of perforated duodenal ulcer there is one diagnostic pitfall. It is the phenomenon of the right paracolic gutter. When a duodenal ulcer perforates, the ascending colon may act as a watershed and direct the escaping fluid to the right iliac fossa (*Fig. 559*). Thus, as judged by the extent of abdominal rigidity, the differential diagnosis between a perforated duodenal ulcer and perforated appendicitis can become exceedingly difficult. It is true that in the former the rigidity tends to be more extensive and when rebound tenderness is tested the maximum tenderness is found to be higher than would be expected in appendicitis, but admittedly it is often a

problem to decide which organ is at fault. It is in this connexion that Rovsing's sign (see p. 298) is sometimes of assistance.



Fig. 559.—Fluid tracking down the right paracolic gutter, which explains how the symptoms and signs of a perforated duodenal ulcer can be referred to the right iliac fossa.

**Perforated Duodenal Ulcer sealed by Omentum.**—This is well worth bearing in mind. The patient can move about surprisingly well; indeed, he may walk to hospital. Vomiting is absent, which counts against a diagnosis of appendicitis or cholecystitis. Rigidity is variable depending on the amount of leakage, but confined to the epigastrium and right hypochondrium (Fig. 560).



Fig. 560.—Physical signs recorded in a case of perforated duodenal ulcer sealed by omentum, known colloquially as 'dry perforation'.

#### MASSIVE HAEMORRHAGE FROM A PEPTIC ULCER WITH OR WITHOUT HAEMATEMESIS

When the loss of blood is great enough to produce signs of hypotension or necessitate the administration of 1500 ml. or more of blood in 24 hours, by convention the haemorrhage is said to be massive.

**First visit:** The patient should lie flat in bed with only one pillow beneath the head, and be kept warm, but not heated artificially in any way. Take the pulse-rate for over a full minute and a reading of the blood-pressure. These data as compared with those at a future examination are often more valuable than laboratory reports. Inquire whether the patient has ingested aspirin recently; this can cause bleeding from the normal gastric mucosa in susceptible persons. Come to a

conclusion concerning the patient's pallor (if present) in the facies, the conjunctiva of a lower lid, and the finger-nails—these are the best guides. Examine the tongue for dryness. Then examine the abdomen. Palpate gently for tenderness and rigidity to exclude a concomitant perforation. Deep palpation for a lump in the epigastrium should be eschewed at this early stage. Always disturb a partially exsanguinated patient as little as possible. None the less, the sign of Troisier (*see* p. 141) should be sought from in front. Also exclude portal hypertension by examining for spider naevi, palmar erythema, and an enlarged liver and spleen.

*Rectal examination* in the dorsal position is of fundamental importance. If faeces are present the all-important question is, 'Is the faecal matter blended with recognizable blood, or are the faeces tarry?' If the latter, enquire if the patient is taking an iron preparation by mouth.

*Second visit:* Once the patient has had one hour's rest, with blood transfusion, the pulse-rate is a reliable guide. Signs that bleeding has seriously depleted the blood-volume, and is probably progressing, are beads of perspiration on the forehead, cool clammy hands, and increasing anaemic pallor, though the last is sometimes difficult to perceive in artificial light. Quickening of the quarter-hourly pulse-rate is the best single sign of progressive or renewed bleeding. A gastric aspiration tube should be in situ, and the nature of the aspirate is valuable direct evidence.

Should the rate of respiration increase *pari passu* with the pulse, the cause is more likely to be cardiac failure or bronchopneumonia, particularly if increasing pallor is not in evidence (Bentley).

A probable source of severe melaena in childhood and in youth (up to the age of about 16) is a peptic ulcer in the vicinity of a Meckel's diverticulum. Often the blood passed per rectum is bright red; it is unmixed with mucus.

### ACUTE CHOLECYSTITIS

The onset is often sudden and the pain is usually severe. After a variable period (usually 2 to 3 hours) biliary colic is superseded by a dull, throbbing pain localized in the right hypochondrium. Nausea, retching, and vomiting, together with belching of a large quantity of gas, a rise in temperature, and an elevated pulse-rate, are characteristic features. The methods employed in the examination of a patient with an acute inflammation of the gall-bladder do not differ from those with chronic inflammation of that structure (*see* p. 234). Tenderness and rigidity can be elicited in the right hypochondrium, and Murphy's sign (*see* p. 235) is present. Jaundice occurs in about 25 per cent of cases. A palpable swelling in the region of the gall-bladder—indisputable evidence that the organ is wrapped in protective greater omentum—often becomes recognizable at some time in the clinical course, but often not when such a finding is most required to clinch the diagnosis, for at that time overlying rigidity renders the mass impalpable. In many instances the diagnosis presents no particular difficulty; in others, right-sided pyelonephritis must be excluded. The condition which is the most difficult to differentiate from acute cholecystitis is a sealed-off perforation (*see* p. 305) or a myocardial infarct (*see* p. 327) or the following:—

*Sudden Tender Enlargement of the Liver in Congestive Cardiac Failure.*—The temperature is normal and the patient is manifestly short of breath. The fact that the liver is uniformly enlarged may be masked by overlying rigidity. The essential clue is that the external jugular veins are engorged (*see* Fig. 34, p. 17).

FREDERICK H. BENTLEY, *Contemporary Surgeon, Portland, Oregon, formerly Professor of Surgery, Newcastle upon Tyne.*

JOHANN FRIEDRICH MECKEL (the Younger), 1781–1833, *Professor of Anatomy and Surgery, Halle, Germany.*

## ACUTE PANCREATITIS

Acute pancreatitis can occur at almost any age, but is unusual before the thirtieth year and rare in childhood. In some parts of the world, notably the U.S.A., alcoholism is an important factor. In 50 per cent of cases there is a history of similar, though less severe, previous attacks.

**Pain.**—This condition competes with perforated peptic ulcer in producing the most severe of all abdominal pains which is constant more often than colicky and gradually increases in agonizing severity. The pain is centred in the epigastrium and it tends to radiate to the back or to the left loin. In order to gain some measure of relief, often the patient sits up and leans forward —————→ or lies on the side in the knee-chest position.

**Vomiting** usually follows the pain, but it has no characteristic features; distressing retching is much in evidence.

**Hiccup.**—Often this is present, due to irritation of the undersurface of the diaphragm by peritoneal exudate.

**Pulse.**—The pulse-rate is nearly always quickened from the commencement.

**Temperature** is at first subnormal. Seldom during the first 24 hours does it rise much above normal.

**Shock.**—In the past much emphasis has been placed on the dramatic development of shock. Some degrees of shock is present in 25 per cent of cases: only in very severe cases is it pronounced and long lasting.

**Cyanosis.**—In its most severe forms acute pancreatitis is accompanied by slight cyanosis of the lips.

**Jaundice.**—Slight jaundice is often evident in natural light.

**Abdominal Examination.**—**Rigidity:** The absence of general rigidity, or at any rate the absence of board-like rigidity, is a sign of considerable importance. As with almost every dogmatic statement relating to clinical matters, there are exceptions.

**Tenderness** and rebound tenderness are present in the central region of the upper abdomen and are usually most pronounced just above the umbilicus. When acute pancreatitis is suspected the left costovertebral angle should be palpated for tenderness due to inflammation of the tail of the pancreas.

**Differential Diagnosis.**—The condition for which acute pancreatitis is mistaken most frequently is a perforated peptic ulcer. Nearly as often, biliary colic is diagnosed. Myocardial infarction also is to be reckoned with when the attack is very sudden and severe, and pallor, sweating, low blood-pressure, and oliguria dominate the picture.

An incontestable diagnosis of acute pancreatitis has become more essential and more responsible, because it is now agreed that laparotomy should not be performed for this condition. It is therefore mandatory that the diagnosis be confirmed by a scientific method, or methods if facilities exist.

**The Serum-amylase Level** is the pillar upon which rests the diagnosis. A considerable rise is good corroborative, but not absolute, evidence of the disease.

**Later Manifestations.**—**Ileus:** After 12 hours, peristalsis diminishes and unless it is prevented by gastro-intestinal aspiration, abdominal distension supervenes.

**A Tender Mass in the Epigastrium** due to fluid in the lesser sac (pseudopancreatic cyst) can occasionally be felt from the fourth to sixth days.





*Skin Discoloration* has been reported in the left flank and also around the umbilicus in a few cases of late acute pancreatitis.

### ACUTE INTESTINAL OBSTRUCTION

Whether it be of the strangulating or the non-strangulating variety, the mortality from acute intestinal obstruction rises with each passing hour from the onset of symptoms. Consequently early diagnosis remains one of the practitioner's greatest responsibilities. Often it can be made without radiological assistance which, although desirable, is not essential except in cases of doubt.

#### ACUTE OBSTRUCTION OF THE SMALL INTESTINE

This is more difficult to diagnose in its comparatively early stages than similar obstruction of the large intestine.

*Pain.*—When the obstruction lies in the jejunum or high in the ileum, the characteristic bouts of intestinal colic, each waxing in intensity to an agonizing zenith and then waning, occur at intervals of 3–5 minutes. In obstruction of the terminal ileum the intervals are longer-lasting—6–10 minutes.

*Vomiting.*—Retrograde peristalsis causes the stomach to eject whatever food or fluid it contains; this is followed by the contents of the duodenum, which are predominantly bile. Later the contents of the small intestine above the site of the obstruction is expelled with gradual lessening force as the antiperistaltic waves grow weaker. Inspect the vomitus as described on p. 18. Only after three or more days of virtually complete intestinal obstruction does the vomit become faeculent.

*Dehydration.*—Obstruction of the jejunum or high in the ileum results in a tremendous loss of water and electrolytes. Conversely, obstruction of the terminal ileum is associated with relatively little loss of fluid and salts, for most of the secretions of the alimentary canal are resorbed for at least two or three days after the onset of obstruction situated in this region. It therefore follows that signs of dehydration are slow to develop in obstruction of the terminal ileum, whereas in obstruction of the jejunum they become obvious, and often overwhelming, in 48 hours.

*Constipation.*—The absence of a history of recent constipation in no way excludes a diagnosis of obstruction of the small intestine. For instance, if the patient had his bowels open in the morning and the symptoms commenced in the afternoon, it would be necessary to wait for at least 24 hours for constipation to be a significant sign. Moreover, the rule that constipation is present in intestinal obstruction is broken in mesenteric vascular occlusion (*see* p. 317), Richter's hernia, and a pelvic abscess associated with obstruction by adhesions—all of which are liable to produce an irritative diarrhoea.

*The Tongue.*—In late untreated intestinal obstruction it is brown, furred, and dry.

**Abdominal Examination.**—In a suspected case of acute intestinal obstruction, the first duty should be to *examine the hernial sites, inguinal, femoral, and umbilical*. This axiom is an old one, but one that can still bear much repetition. An umbilical hernia can hardly be missed; an irreducible inguinal hernia usually is obvious; it is the small unobtrusive femoral hernia that is the stumbling-block, the frequency with which such a hernia, often of the Richter type, being overlooked is astonishing. Usually the patient is an old lady. Occasionally the attending practitioner has seen and felt the lump, but has considered it to be an enlarged lymph-node. Far

more frequently, pandering to the false modesty of his patient, he has failed to draw down the bedclothes far enough. With proper exposure (*Fig. 561*), almost invariably the tell-tale lump is perfectly evident, the exception being extreme obesity.

*Inspection.*—In those early stages, where it is imperative to make a correct diagnosis, obstruction of the small intestine rarely shows more than perhaps a suggestive fullness. Ladder patterns are very characteristic (*Fig. 562*) but are not commonly seen, and, for that matter, should not be, for their presence indicates a late diagnosis. Visible peristalsis more often requires patient watchfulness. Sit down beside



*Fig. 561.*—When the history suggests intestinal obstruction, the abdomen should be uncovered from the nipple to the apex of the femoral triangle. Only in this way will small irreducible herniae cease to be overlooked.



*Fig. 562.*—Visible peristalsis, showing the characteristic ladder pattern. Case of irreducible right femoral hernia, which can be seen also.

the bed and watch the abdomen. Sometimes gentle flicking of the abdominal wall will initiate visible peristalsis.

*Palpation* occasionally reveals a lump, such as an intussusception, a neoplasm of the small intestine, an intra-abdominal abscess to which small intestine is adherent, or, exceptionally, a coil of distended intestine entrapped by a band or in an internal hernia. Even when peristalsis is not visible, it may be palpable. If the hand is kept flat upon the abdomen the underlying coil may be felt to harden and soften alternately, much like a pregnant uterus (Burgess).

Rebound tenderness (*see p. 296*) in a localized area suggests that the obstructed bowel has lost its blood-supply (i.e., it is strangulated).

*Percussion* usually is inconclusive except that a resonant note is obtained all over, indicative of gaseous distension of the bowel.

*Auscultation.*—All the time we have been watching, percussing, and palpating the abdomen, we should at the same time have been listening—for borborygmi. Now comes the time for unhurried abdominal auscultation. Again take a chair and sit beside the right side of the patient's abdomen. Apply the cup of the stethoscope to the abdominal wall just below and to the right of the umbilicus. When the case is one of acute obstruction of the small intestine in its comparatively early stages, it will not be long before the clinician will hear gurgling sounds. These characteristic sounds commence at a low pitch and, in the course of 30 seconds, rise to higher-pitched tinkles, the pitch becoming higher as intraluminal tension

risers. *The coexistence of intestinal colic and borborygmi answering to this description establishes the diagnosis of obstruction of the small intestine in more than 9 out of 10 cases* (Dennis).

A *Succussion Splash* (see p. 233) heard with the stethoscope is confirmatory evidence that there is a distended loop or loops of bowel containing fluid.

**Rectal Examination.**—In cases of obstruction of the small intestine digital examination of the rectum usually reveals no abnormality. Occasionally it is possible to make out a distended coil of small intestine in the pelvis. It is also possible that the lump caused by an intussusception, a neoplasm of the small intestine, or a gall-stone obstructing the small intestine may be felt. Rarely will the apex of an intussusception caused by an inverted Meckel's diverticulum, or a polyp, be palpable.

#### ACUTE OBSTRUCTION OF THE LARGE INTESTINE

In many parts of the world acute obstruction of the large intestine is, almost exclusively, the result of a carcinoma of the colon or of the rectum. The minority of remaining cases is due to chronic diverticulitis or, in the case of the rectum, to faecal impaction. Such obstruction is, more correctly speaking, acute-on-chronic obstruction. Only in those dwelling in, or hailing from, Eastern Europe, Peru, Scandinavia, Ghana, and some parts of India is obstruction from these causes rivalled in frequency by volvulus of the pelvic colon (see p. 316), which gives rise to very acute, as opposed to acute-on-chronic, intestinal obstruction. In Iran volvulus of the pelvic colon, caecum, and small bowel make up nearly half of all intestinal obstructions (Saidi). In Nigeria the commonest cause of intestinal obstruction at all ages (apart from external hernia) is idiopathic intussusception (Cole).

Before detailing the peculiar features of acute-on-chronic obstruction of the large intestine it is essential to dwell for a moment on the ileocaecal valve, which is a sphincter (Chesterman). When occlusion of any part of the large intestine occurs its behaviour determines the clinical course, and therefore the physical signs, of the obstruction. There are three possibilities, each present in approximately a third of cases (Fig. 563).

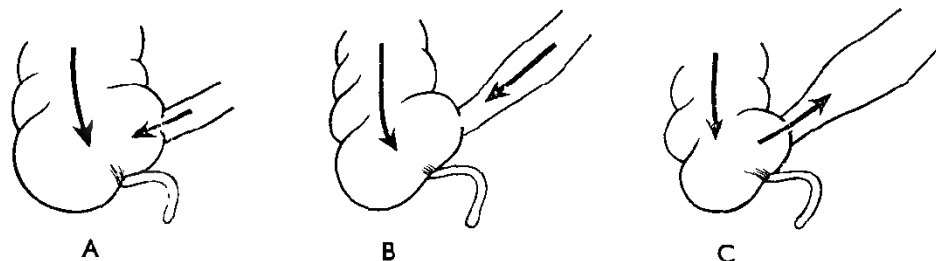


Fig. 563

*Type 1 (Fig. 563 A). The Valve retains its Normal Function, i.e., it prevents reflux into the ileum but its periodic relaxation synchronizes with each peristaltic wave of the ileum. This allows the contents of the small intestine to pass into the large intestine and causes a comparatively rapid and great increase of intraluminal pressure within the colon, and particularly within the caecum. The distension is confined to the large intestine above the site of the obstruction, and is so excessive that it sometimes imperils the blood-supply of the caecal wall and terminates in gangrene.*

*Type 2 (Fig. 563 B). The Valve remains Contracted.*—Increasing distension of the large intestine proceeds at a moderate pace, while signs of obstruction of the ileum,

due to its inability to pass its contents onwards, commence a few hours after the onset. By the time the patient presents, more often than not the signs are those of combined large and small gut obstruction.

*Type 3 (Fig. 563 C). The Valve relaxes and remains Incompetent.*—Reflux from the large into the small intestine permits the former to decompress itself into the latter. As a result, signs of acute intestinal obstruction are long-delayed, and when they do become apparent they are virtually indistinguishable from those of obstruction of the ileum. Only in this type of large-gut intestinal obstruction is ballooning of the caecum absent.

For these reasons, in acute large bowel obstruction the clinician must expect a varying picture. However, in general it can be stated that obstruction of the large intestine commences less abruptly than that of the small intestine, and in the acute-on-chronic variety it is always preceded by increasing constipation over several, if not many, days. When the acute stage has been reached, the intervals between the bouts of the colicky pain and hyperperistalsis are longer and less rhythmical than when the obstruction is situated in the small intestine. Vomiting is delayed for days. Thus, unless the acute obstruction has been allowed to persist until a very advanced stage, or complications have set in, the patient neither looks nor feels ill. The distension is mainly gaseous.

**Abdominal Examination.** *Inspection.*—Except in Type 3, obstruction of the large intestine gives rise to early abdominal distension which fills the flanks. In Type 1 and Type 2, wherever the obstruction may be, the brunt will be seen at the caecum, which occasionally can be seen momentarily rising with each wave of peristalsis, like a small balloon. In every suspected case of colonic obstruction, particular attention should be paid to the right iliac fossa.

*Palpation.*—The main objective is to seek the presence of a lump in the course of the colon, but in view of the fact that it is an annular carcinoma, as opposed to a large mass, that usually gives rise to obstruction, we are seldom thus favoured because of the concomitant distension. While carcinoma occurs in all parts of the colon, the incidence of obstruction in the right half is five times less than that in the left half.

*Percussion.*—Hyper-resonance, particularly over the caecum, is a *sine qua non*.

**Rectal Examination** is imperative, carcinoma of the rectum being an occasional cause of acute large-intestine obstruction. Sometimes a mass of inspissated faeces causing impaction will be felt, its identification becoming indisputable if the mass can be indented by the finger. The apex of an intussusception initiated by the presence of a circumscribed benign or malignant neoplasm of the colon is an infrequent, but welcome, finding—welcome because, even if it should prove to be a carcinoma, the neoplasm that intussuscepts is assuredly at an early stage of its development. Ballooning of the rectum is a not infrequent, but unreliable, sign of obstruction beyond the finger. If the rectum is completely empty, it is at least suggestive of higher obstruction.

**Other Methods of Examination.** In doubtful cases an *enema* should be given, but it should be remembered that it is the second enema which yields the more useful information. By absolute constipation is meant that after the *second* enema no faeces and, above all, no flatus is passed.

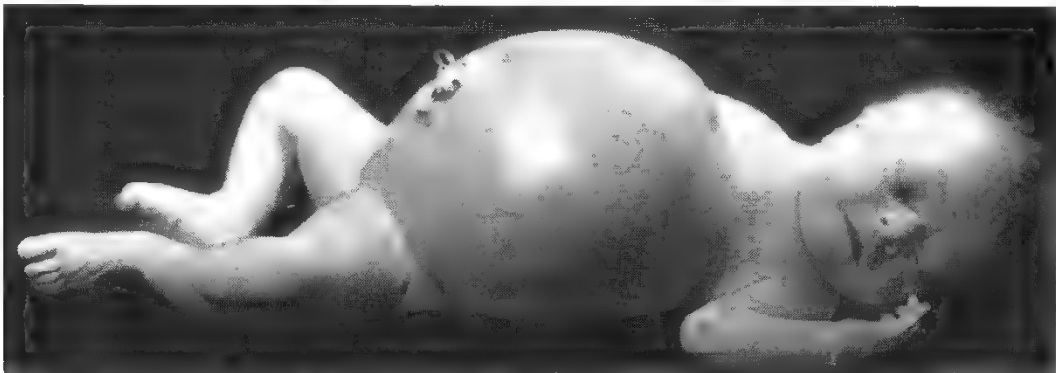
If in doubt and radiographic facilities are lacking take a *tape-measure* and place it round the abdomen at the level of the umbilicus. Note the measurement. Leave it in place behind the patient,

and measure again in 2 hours. This accurate measurement of the girth is more reliable than an impression as to whether distension is greater than at a previous examination.

Before leaving the subject of intestinal obstruction it is necessary to warn the reader to keep a sharp look-out for *uraemia*, which on occasions simulates intestinal obstruction closely (*see p. 317*).

### SPECIAL VARIETIES OF INTESTINAL OBSTRUCTION

**Intestinal Obstruction in the Newborn.**—During the first 36 hours of life 90 per cent of babies vomit amniotic fluid, vaginal secretions, and blood, swallowed respectively before and during birth. When a newborn baby vomits repeatedly and continues to vomit, there are only three explanations—intracranial haemorrhage, severe infection, and intestinal obstruction. As a rule, the first and second conditions show such special characteristics that their identification is assured; exceptions to this rule are a subdural haematoma (*see p. 67*) and meningitis, especially that due to *Esch. coli*.



*Fig. 564.*—Meconium ileus. The superficial dilated veins and the shiny appearance of the skin are characteristic.

*The Vomiting of Intestinal Obstruction.*—Should the vomitus become bile-stained (green\*) it is safe to assume that the cause of vomiting is intestinal obstruction.

*Abdominal Distension.* Minor degrees are difficult to perceive because of the normal protuberance of an infant's abdomen. Pronounced fullness at birth suggests intestinal obstruction arising in utero, but there are other causes, notably a distended bladder due to urethral obstruction, congenital cystic kidneys, foetal ascites, and meconium peritonitis. In all except the last, a considerable part or most of the abdomen is dull to percussion. When tympanitic distension is present at birth, and dilated veins are seen coursing over the abdominal wall (*Fig. 564*), the case is almost certain to be one of meconium ileus (inspissated meconium blocking the ileum—a condition due to fibrocystic disease of the pancreas). Distension due to congenital atresia of the intestine does not appear until six or more hours after birth, and is for the most part the result of the swallowing of air.

*Failure to pass Meconium* is an important corroborative sign of neonatal intestinal obstruction. Nevertheless, during the first three days of life its passage is not inconsistent with a diagnosis of intestinal obstruction; indeed, 40 per cent of infants suffering from intestinal atresia pass meconium stools.

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\* In the newborn yellow coloration of the vomitus derives from carotene present in colostrum and is not abnormal.



**Rectal Examination.**—Imperforate anus is discussed on p. 289. In other varieties of intestinal obstruction the anal canal and distal rectum are often narrowed, and withdrawal of the finger is seldom followed by the passage of meconium, as is usual in neonates.

**General Appearance.**—Normally the neonate lives on its own resources until the maternal flow of real milk is established, and it is this fact that accounts for the seeming lustiness of a neonate with intestinal obstruction during the first 48 hours of life—a misleading fact that encourages procrastination in making the diagnosis. Only in the strangulating obstruction of volvulus of the midgut is this misleading paradox absent, for dehydration and electrolyte depletion occur rapidly because of the copious vomiting of bile and pancreatic and gastric secretions.

**Sudden Deterioration of the Infant** usually coincides with commencing gangrene of the intestine; the chemical imbalance resulting therefrom causes instability of the respiratory centre and early exodus from collapse of the lungs or weakening of the cough reflex, which invites inhalation of gastric contents, and inevitable pneumonia.



Fig. 565.—Examination of the abdomen of an infant for an intussusception. Palpation under the bedclothes between the spasms. The clinician must be seated.



Fig. 566.—Positions at which the lump of an intussusception may be felt. In the left hypochondrium it may sometimes be difficult to feel, for it becomes sheltered by the costal margin.

Although intestinal obstruction in the newborn is often remediable by early operation, frequently the condition remains undiagnosed for several days. Therefore greater effort should be made to recognize the signs set out above and to resort to plain radiography of the abdomen to help in confirming the diagnosis before the infant becomes enfeebled.

When confronted with a neonate who exhibits some of the signs of intestinal obstruction, the following possibilities must also pass through the clinician's mind:—

**Congenital Atresia of the Oesophagus.**—See p. 199.

**Infantile Pyloric Stenosis** (see p. 233) is rare before the third week of life. There is no bile in the vomit.

**Hirschsprung's Disease.**—See p. 248.

**Examination of an Infant for an Intussusception.\*** —The age incidence has altered, probably due to earlier weaning. Cases are now seen as early as two months and up to two years.

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\* *Intussusception*. Latin, *intus* = within + *suscipere* = to receive. The receiving of one part within another.

Almost invariably the nurse will start to pull down the bedclothes in order to expose the child's abdomen. Request her not to do so. If the child is asleep, so much the better, but we are rarely so favoured. Take a chair and sit beside the bed—wait, and warm the right hand. Slip the warm hand under the bedclothes, place it upon the abdomen, and go on waiting until the child stops crying (*Fig. 565*). One cannot expect to feel an intra-abdominal swelling when the child is screaming; its abdominal muscles are contracted rigidly. When the crying has ceased—palpate. Pay particular attention to the right hypochondrium. Sometimes the swelling will be felt to harden as a wave of peristalsis commences, and the diagnosis is certain. In the splenic region the lump may pass beneath the costal margin, thus eluding the examiner (*Fig. 566*).

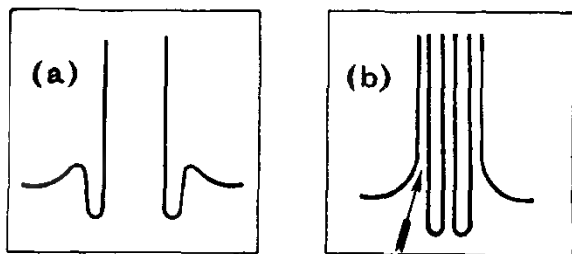
During the whole time palpation has been in progress, the clinician should be observing the patient's face intently. When crying has ceased, the colour of the cheeks is noted: is the child paler than it should be? In this connexion, bear in mind that a child suffering from intussusception never smiles, and in cases of more than 6 hours' duration signs of dehydration (*see p. 46*) appear.

One most important piece of information to be gleaned from the face is, is the baby undergoing spasms of colic? If the abdominal muscles harden simultaneously with a fleeting expression of pain that is a prelude to an attack of crying, there can be no doubt about one important piece of information. The little patient is experiencing colic.

**Pyrexia.**—In most patients the temperature becomes somewhat elevated during the first 24 hours. A clinician unfamiliar with the condition might interpret the pyrexia to indicate an infection rather than an intussusception, but severe colic and pallor, with intervals of quietude, contrast with the continual whimpering and flushing of the face of a baby with upper respiratory infection.

The '*Sign de Dance*'—a feeling of emptiness in the right iliac fossa—is not of much help, seldom being ascertainable in these small patients except, possibly, when under an anaesthetic preparatory to an operation.

**Rectal Examination.**—The left lateral position is adopted. If the lump is low enough in the colon, it will be felt. The apex of an intussusception feels exactly like a cervix uteri. Be careful to look at the examining finger afterwards—a 'red-currant jelly' exudate is pathognomonic (*see Fig. 39, p. 20*). Ask to see the baby's soiled napkin and scrutinize the discharge.



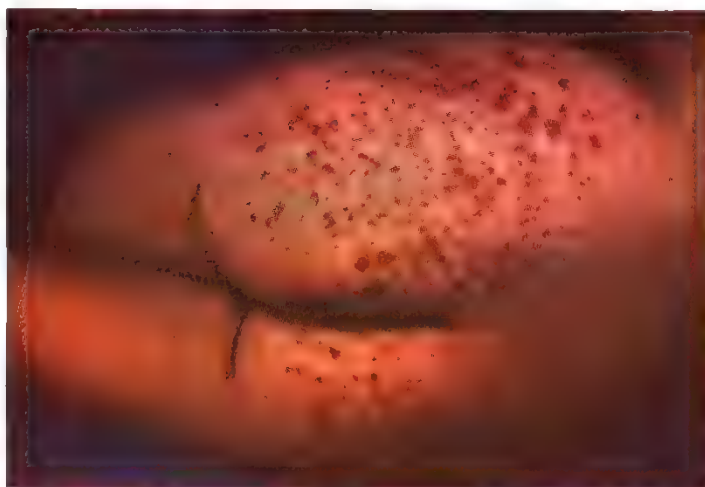
*Fig. 567.*—The differential diagnosis between (a) rectal prolapse and (b) intussusception protruding from the anus. In rectal prolapse the projecting mucosa will be felt continuous with the perianal skin, whereas in intussusception the finger passes *ad infinitum* into the depths of the sulcus.

**Intussusception protruding from the Anus.**—This is now a rarity. The differential diagnosis between prolapse of the rectum and intussusception is the cause of perplexity, for in both conditions there is a large rosette of congested mucosa presenting externally. The problem is solved as shown in *Fig. 567*.

**Intussusception in Adolescence** is usually caused by an inverted Meckel's diverticulum. Peutz-Jeghers syndrome (*see p. 110*) is worthy of exclusion.

**Acute Intussusception in Adults.**—Unless the apex of the intussusception appears at the anus, or can be felt per rectum, the correct diagnosis rarely is made before operation. The key physical sign is a sausage-shaped lump that can be felt to harden beneath the palpating fingers; a lump that is felt at one time, but not at another—in point of fact, a lump that is either found by chance or, more often, by painstaking frequent abdominal examinations. In its fully developed state the intussusception gives rise to strangulating obstruction.

Fig. 568.—Large cutaneous haemorrhages in a case of purpura.



**Intussusception and Purpura.**—Sometimes in older children and adults the symptoms of intussusception (intestinal colic and the passage of blood-stained mucus) are closely mimicked by purpura with intestinal symptoms; indeed, occasionally an intussusception results from the protrusion caused by a submucosal haemorrhage occurring in this condition. At first sight,

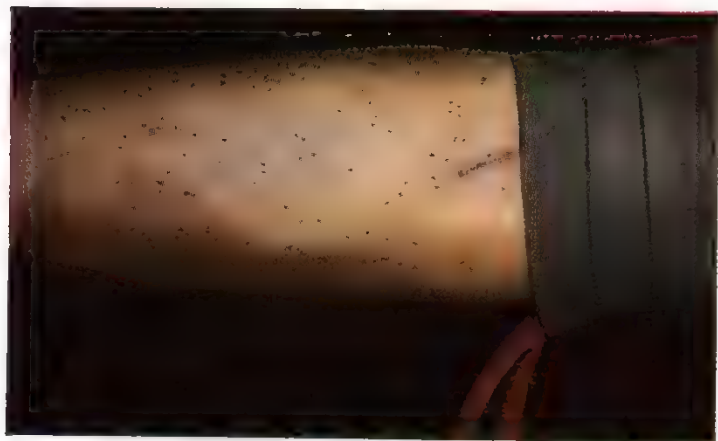


Fig. 569.—Tourniquet test for purpura—a positive reaction.

especially in an artificial light, the multiple small petechial\* haemorrhages in the skin that characterize purpura have been mistaken for flea-bites. If the skin of the whole body is examined, larger ecchymoses† or definite bruises may be found, especially on the buttocks (Fig. 568) and the lobules of the ears.

In such cases the abdomen should be palpated for the presence of a lump, and the left hypochondrium examined for enlargement of the spleen. In only a quarter of cases of

\* *Petechia*. Latin = a spot.

† *Ecchymosis*. Greek, ἐκ = out + χυμός = juice. Skin discoloration due to extravasation of blood.

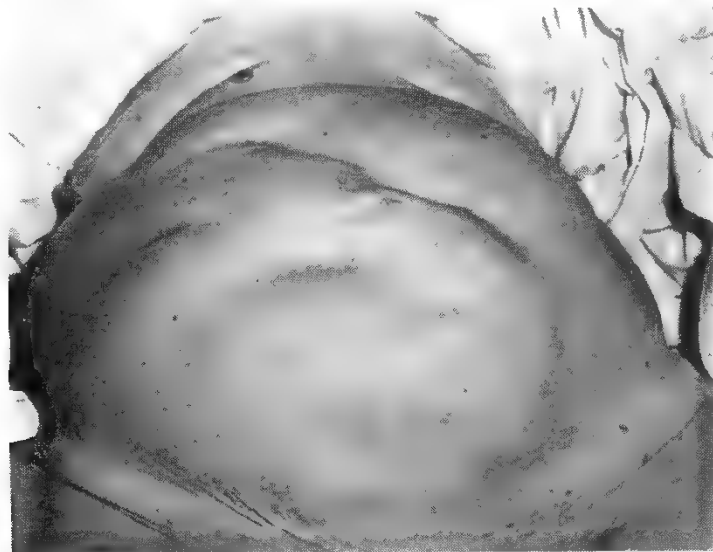
thrombocytopaenic purpura (the most common variety to give rise to intestinal symptoms) is the spleen enlarged to the extent of being palpable.

**Hess's Tourniquet Test for Capillary Fragility.**—This is performed by applying the cuff of a sphygmomanometer to an arm, and after taking the blood-pressure, inflating the cuff to register a pressure midway between that of the systolic and diastolic pressures, for 5 minutes after which the cubital fossa is examined for petechiae. If more than twenty are present in a 3-cm. diameter circle (*Fig. 569*) the test is positive, indicating excessive capillary fragility—the abnormality in all the purpuras.

**Gall-stone Ileus.**—Obturation of the small intestine by a gall-stone is perhaps the most elusive form of intestinal obstruction. Usually the subjects are elderly, and the obstruction in the early stage is of an intermittent character. The possibility of this supremely remediable condition should be before us in every doubtful case of obstruction occurring in the evening of life.

An abdominal radiograph may show the stone; alternatively, the bile-passages may be outlined by gas which has entered via the fistula between the gall-bladder and bowel.

**Food Bolus Obstruction.**—As with gall-stone ileus the obstruction tends to be intermittent. Clues to the correct diagnosis are firstly that the patient has had an operation which includes some form of gastro-enterostomy or pyloroplasty, and secondly has recently ingested vegetable matter (commonly orange-pith) which has been improperly chewed, the patient often being edentulous.



*Fig. 570.*—In volvulus of the sigmoid colon, owing to the length of the mesentery the swelling is seen first in the right iliac fossa.

**Volvulus of the Sigmoid.**—Middle-aged or elderly males are the usual victims. There is often a history dating back for some time of attacks of abdominal pain with constipation, followed by watery stools and copious evacuation of flatus. These attacks are due to twists that undergo spontaneous rectification. As a rule, the onset is sudden, and is characterized by severe abdominal pain, usually coming on while the patient is straining at stool. In no other conditions does extreme abdominal distension come on so quickly (*Fig. 570*). In a matter of six hours the whole abdomen becomes distended. Hiccup and retching occur early; vomiting is late. Constipation is absolute, but an enema may be returned blood-stained. As mentioned on p. 288, occasionally the rectal wall is felt to be oedematous.

**Volvulus of the Caecum.**—For this to occur the caecum must have a mesentery which often serves the whole of the small intestine as well as the right half of the

colon. Consequently, do not expect the ballooned obstructed caecum necessarily to occupy the right iliac fossa. Typically a tense, palpable, resonant swelling occupies a central position and sometimes becomes visible during a spasm of colic, being thrown into relief by a concavity in the right iliac fossa. As a rule, the patient is considerably younger and thinner than one suffering from volvulus of the sigmoid, but the previous history is similar.

### CONDITIONS SIMULATING ACUTE INTESTINAL OBSTRUCTION

**Mesenteric Vascular Occlusion.**—The signs are those of intestinal strangulation but seldom those of intestinal obstruction. After a variable length of time (hours–days), signs of diffuse peritonitis monopolize the entire picture.

Mesenteric *arterial* occlusion occurs suddenly.

*Shock* is pronounced in the early stages.

*Pain* is colicky at first but after about an hour it becomes unrelenting. The pain appears too severe to be reconciled with the moderate signs exhibited on abdominal examination: in this respect mesenteric arterial occlusion resembles acute pancreatitis.

*Vomiting* is so oft-repeated that it occasions great distress. Intubation having been carried out, the aspirate continues to be copious and soon changes from 'pure bile' to more faeculent-appearing fluid.

*Haematemesis and/or Melaena* occurs in about a third of cases.

**ABDOMINAL EXAMINATION.**—*Rigidity* is circumscribed: it is confined to that part of the abdominal wall overlying the infarcted area.

*Tenderness* on palpation and rebound tenderness are also confined to the above-named area, which is usually centred just above the umbilicus.

*An Indefinite Lump* is found in a few cases. If present, it is likely to react to the law of gravity when the patient is placed on the left side, i.e., it shifts towards the left flank.

Should a patient with the above symptoms and several, or all, of the above signs be known to be suffering from mitral stenosis or auricular fibrillation, or be an elderly patient with pipe-stem arteries and cardiac impairment, the provisional diagnosis of mesenteric arterial occlusion should follow. At the same time, the condition sometimes occurs spontaneously in healthy individuals.

Mesenteric *venous* occlusion is an entirely different type of lesion; it occurs over many hours or even days. Usually it follows intra-abdominal infection or results from portal hypertension. When infarction becomes massive the signs become indistinguishable from those of mesenteric arterial occlusion. A diagnostic enema often produces a stool containing much dark blood.

**Uraemic Ileus.**—Abdominal distension, hiccup, and vomiting are frequent accompaniments of advanced uraemia, and uraemic ileus is not infrequently mistaken for intestinal obstruction. Both intestinal obstruction and uraemia can give rise to oliguria. Uraemia from chronic renal failure can mimic intestinal obstruction in two ways. In the first place intense vomiting of sudden onset sometimes occurs in uraemia and it simulates the vomiting of obstruction of the small intestine. If the patient is very thin, normal peristalsis is visible and the resemblance to intestinal obstruction is heightened. Secondly, uraemia often is accompanied by unmistakable abdominal distension due to paralytic ileus, and in view of the fact that most examples of obstruction of the large intestine occur in elderly patients,



among whom renal insufficiency is not uncommon, the possible presence of uraemic ileus must be kept in mind.

When the signs are due to uraemia there may be a uriniferous smell in the breath; infrequently an enlarged kidney or kidneys can be palpated—in cases due to congenital cystic kidneys there is seldom difficulty in this direction. In uraemia the urine is likely to be, but is not necessarily, loaded with albumin. Furthermore, there is no evidence of increased peristaltic activity as recognized by abdominal auscultation, nor evidence of mechanical obstruction on a plain erect radiograph of the abdomen, but there *is* considerable elevation of the blood-urea.

### ACUTE MANIFESTATIONS OF CROHN'S DISEASE

**Acute Regional Ileitis** occurs in only 5 per cent of cases of Crohn's disease. The symptoms and signs resemble those of acute appendicitis, with one notable exception, viz., almost invariably diarrhoea precedes the acute attack. Exceptionally, perforation of the intestine resulting in local or diffuse peritonitis occurs. The differential diagnosis from acute appendicitis is so difficult that, as a rule, operation is to be advised.

#### **Acute Episodes in the Course of Chronic Regional Ileitis.—**

*a.* The patient presents with pain in the right iliac fossa and a tender mass can be felt in that region, and frequently by pelvic examination also. If there is a history extending over months or years of intestinal colic accompanied by diarrhoea remember the possibility of Crohn's disease. Should the patient be suffering from an anal fissure, fistula, or ulcer, this distinctly strengthens the tentative diagnosis; so does a normal or nearly normal temperature. As in the case of an appendix abscess, the next step is to mark out accurately on the skin the periphery of the lump. In a relatively young patient should the appendix have been removed previously, and/or should the patient appear anaemic, a tentative diagnosis of regional ileitis can be made.

Treated expectantly, unlike most appendix abscesses, the lump does not resolve, but neither do lumps due to carcinoma nor those due to actinomycosis or tuberculosis. The difficult differential diagnosis between these four conditions requires for its elucidation radiological and laboratory aid and sometimes elective (as opposed to early) laparotomy.

*b.* The patient is admitted with acute intestinal obstruction. Unless the patient is known to suffer from Crohn's disease there is no means of diagnosing the cause of the obstruction before laparotomy.

### DIFFUSE PERITONITIS

When the clinician sees for the first time a patient in whom bacterial peritonitis is already diffuse, the diagnosis is sometimes difficult, for the signs resemble those of late intestinal obstruction. Even when a diagnosis of diffuse peritonitis has been made, the problem is only half solved, for it is highly desirable to know the site of origin of the peritonitis.

Helpful in arriving at a diagnosis of diffuse peritonitis is the fact that the patient prefers to lie with his knees drawn up. Should the presence of abdominal tenderness be doubtful, as it is when the patient is highly toxic, a useful manœuvre is to press the anterior surface of the upper part of the thigh of the patient, who

will generally agree that there is no tenderness there. The pressure is continued upwards. If, when the inguinal ligament has been crossed, the patient suddenly complains of tenderness, it is proof that peritoneal irritation is present.

**Meconium Peritonitis** is a sterile chemical peritonitis in which, in a large percentage of cases, the perforation becomes sealed during intra-uterine life. Should the perforation be still patent at the time of birth, to the chemical peritonitis is added bacterial peritonitis soon after the first feed. In most respects the signs resemble those of intestinal obstruction, but uniform distension is more in evidence than vomiting. When bacterial peritonitis has supervened, oedema of the abdominal wall is an additional characteristic sign.

**Pneumococcal Peritonitis**, now a rarity, may occur primarily, or as a complication of pneumonia. The signs closely resemble acute appendicitis with pelvic peritonitis, the only distinguishing features being:—

1. The type of individual. Usually a poorly nourished female child.
2. Considerable meteorism is often an early feature. Should an inguinal hernia be present, the sac is likely to be distended, but the contents are reduced easily.
3. Even in the primary variety; a tinge of cyanosis often is discernible and the alae nasi may move as actively as in pneumonia; often herpes on a lip or a nostril is present.
4. After 24 to 48 hours profuse diarrhoea, occasionally blood-stained, is characteristic. Increased frequency of micturition also is often present. Both are due to pelvic peritonitis.

**Primary Streptococcal Peritonitis** is also rare. Apart from (3) above the physical signs are identical with those of pneumococcal peritonitis. In both varieties the diagnosis must be confirmed by finding no other cause at laparotomy.

**Peritonitis following Parturition or Abortion.**—Rigidity seldom is much in evidence; this, at any rate in part, is due to the stretched state of the abdominal musculature. The lochia may be offensive, but not necessarily so. Diarrhoea is common, due to a pelvic abscess which may be detected on rectal examination.

**Postoperative Peritonitis.**—It is hard to decide whether the signs are due to paralytic ileus following operative trauma, or to infection. Rigidity, one of the mainstays of the recognition of other forms of peritonitis, frequently is non-existent. Tenderness, though present, is likely to be attributed to the recent laparotomy wound. More likely than not a narcotic has been administered and this masks the signs, indefinite as they are. Absence of bowel-sounds, distension (which is slight in fulminating cases), and the bile-stained gastric aspirate will almost certainly be thought to be due to paralytic ileus rather than to postoperative peritonitis. There is often evidence of postoperative atelectasis (*see* p. 197), which may be thought to account for the rise in pulse-rate and temperature.

A steadily increasing pulse-rate and perhaps an undue sharpness of the intellect with some excitability are signs that give an astute clinician a lead in this extremely important (and if undetected early, very fatal) catastrophe. Often after a time lag of 8–12 hours, the Hippocratic facies (*see* Fig. 171, p. 88) becomes manifest.

#### OTHER CONDITIONS COMPLICATING AN OPERATION

**Paralytic Ileus.**\*—A certain amount of distension and flatulence are only too frequent after abdominal operations; such symptoms are due to intestinal paresis. Paralytic ileus can be looked upon as a more advanced, and much more serious, stage of intestinal paresis—a stage in which there is widespread inhibition of the peristaltic wave.

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\* *Ileus.*—In the majority of cases the condition commences in the ileum—hence the name.

Obstructive symptoms commencing *within three days after operation* are usually due to paralytic ileus: true postoperative intestinal obstruction usually comes on *between the sixth and tenth postoperative days*. As a rule, paralytic ileus sets in rapidly and the physical signs to which it gives rise are as follows:—

*No pain is experienced* but sometimes the patient complains of discomfort due to distension. He is usually unapprehensive, indeed quite oblivious of the fact that a serious complication is at hand.

*Thirst* is the leading symptom unless the patient is receiving adequate parenteral fluid. If the patient is allowed to satisfy it, the fluid ingested is regurgitated effortlessly.

*The Pulse-rate* rises almost *pari passu* with the degree of the distension.

**ABDOMINAL EXAMINATION.** *Inspection.*—Early cases show distension most apparent below the umbilicus. As the condition progresses the whole abdomen becomes involved, by which time breathing is mainly of the costal type, and because the excursions of the diaphragm are rendered less deep, the respiratory-rate is increased.

*Palpation.*—There is complete absence of rigidity; slight tenderness is present, even well away from the area of a recent abdominal incision.

*Percussion.*—Usually the whole abdomen is tympanitic.

*Auscultation* is of overriding importance. One often sees the stethoscope applied here and there to the surface of the abdomen for a matter of seconds; this is useless when the important diagnosis of paralytic ileus is at stake. Exhort those in attendance to make every effort to keep quiet and to command anyone in the vicinity to do likewise. Be seated. Apply the cup of the stethoscope firmly to the skin just below and to the right of the umbilicus, and keep it absolutely still, if necessary for 3 full minutes—a more exacting undertaking than might be imagined. If there is a gurgle within any part of the peritoneal cavity, assuredly it will be heard at this central ‘listening post’. In paralytic ileus the clinician must expect to hear, not the hissing, turbulent, rumbling sounds associated with the colic of intestinal obstruction, but an ominous silence, broken only by the ‘lub, dub’ of the patient’s heart-beats, transmitted, presumably, to the abdomen via the overdistended intestinal coils (Patel), broken also by succussion splashes if the patient moves, and by very occasional, weak tinkles.

Measurement of abdominal girth with a tape measure (*see p. 311*) every 3 or 4 hours is useful in assessing progress.

**Acute Dilatation of the Stomach** comes on very suddenly, usually after operations, but sometimes after trauma; for instance, the condition may arise as a complication of fracture of the femur or spine. Typically the patient vomits—usually a very large amount—and soon exhibits signs of shock. He continues to vomit enormous quantities; one wonders where it has all come from. The character of the vomit should bring the condition to mind at once. The very large quantity of brownish-black fluid, which may be likened to the storm water of a peat-laden stream, is pathognomonic (*Fig. 571*).

*Early Diagnosis.*—The day should have passed when the condition remains unsuspected until suddenly attention is focused on the patient because he brings up an enormous quantity of the characteristic fluid. In many instances the clinician is summoned to the bedside because there is something amiss. The pulse is rising. The patient need not look gravely ill. He is not in any pain, but he usually says that he feels uncomfortable. It is of paramount importance to realize that vomiting occurs relatively late. At this stage the patient does not necessarily experience even nausea, but an occasional hiccup is not uncommon. The output of urine is invariably scanty, although during the first few hours this fact cannot be gauged with accuracy. Careful observation of the

upper abdomen may show slight fullness; a characteristic sign is the obliteration of the normal sulcus immediately beneath the costal margin, but in obese subjects this is difficult to assess.

Occasionally when the abdomen is examined a dilated stomach can be made out, but as the greater curvature may be so low as to be hidden in the pelvis, usually a general fullness is all that can be seen. Succussion splash (see p. 233) can be elicited. If acute dilatation of the stomach is even suspected a gastric aspiration tube should be passed and the contents of the stomach aspirated. The use of intravenous drips for supplying fluid post-operatively together with the prohibition of early drinking has greatly reduced the incidence of this complication (and of paralytic ileus).

**Subdiaphragmatic (Subphrenic) Abscess.**—To most clinicians this means right subdiaphragmatic abscess. Consequently abscesses on the left side, which should be expected once in every four or five cases, are missed or the diagnosis is delayed unduly—even more so than with those on the right side.

**Aetiology.**—Nearly all subdiaphragmatic abscesses follow a known intraperitoneal lesion but occasionally the abscess follows a condition which has subsided without an operation. The commonest causes are:—

1. Perforated peptic ulcer	33 per cent
2. Acute appendicitis (usually retrocaecal)	20 per cent
3. Following cholecystectomy	10 per cent
4. Leakage after an operation on the stomach	10 per cent

Other causes constitute a miscellaneous collection of intraperitoneal inflammatory lesions, on the relative frequency of which it is unprofitable to linger.

**Diagnosis.**—The majority of patients feel and look ill. In addition to pain, they complain of anorexia and nausea. The complexion is frequently muddy. 'Signs of pus somewhere, signs of pus nowhere else, signs of pus *there*' was Barnard's aphorism regarding subdiaphragmatic abscess, and a truly marvellous compendium of the situation it is. Having excluded pus in other situations (see p. 302), have regard to the following:—

**The Temperature\*** nearly always fluctuates between 38° and 39° C. or more. In a few cases it alternates, remaining lower, but rarely normal, for a few days, and then rising again. Most exceptionally the patient is apyrexial.

**Rigors** are uncommon, and usually occur in patients with concomitant pylephlebitis or a liver abscess.

**The Pulse-rate** is likely to be raised more than one would expect from the temperature.

**The Respiratory-rate** is usually raised and corresponds to the extent and nature of the thoracic complications.

**Pain** is felt on the side of the lesion, or in the middle line. It is often localized



Fig. 571.—Acute dilatation of the stomach. If a specimen of the vomit is placed in a test-tube and held in a strong light, its characteristic colour will become evident and myriads of small particles may be discerned suspended in the fluid.

\* To some extent this important sign is masked by antibiotic therapy.

in the hypochondrium, although nearly as frequently it is experienced in the lower part of the thorax of the corresponding side. Occasionally the pain is located in the lumbar region. Referred pain in the corresponding shoulder is not infrequent, but special inquiries must be made concerning it.

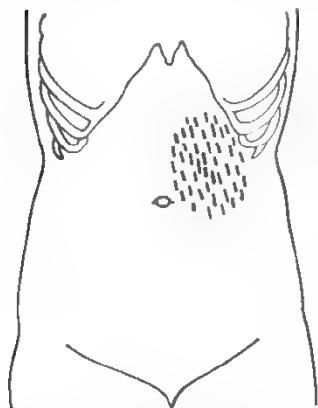


Fig. 572.—Sketch of the findings in a case of left anterior subphrenic abscess.

*Jaundice* is most unusual in subdiaphragmatic abscess. When it is present it is nearly always due to coexisting obstruction to the common bile-duct by a calculus, or to suppurative pylephlebitis.

*Hiccup* is occasional.

*Abdominal Signs.*—In postoperative cases, when the primary lesion was situated in the right upper quadrant of the abdomen, there is nearly always a purulent discharge from the wound. In cases of a right posterior abscess (the commonest situation) there is often tenderness over the 11th intercostal space. To elicit this satisfactorily the patient must be turned on to his face. When the abscess is left-sided and anterior, there is usually tenderness and sometimes a swelling in the position shown in Fig. 572.

*Thoracic Signs.*—Just as in acute osteomyelitis there is a sympathetic arthritis of the near-by joint, so in subdiaphragmatic abscess there is a concomitant basal pleurisy or pleuropneumonia. It must, therefore, be clearly understood that *signs*

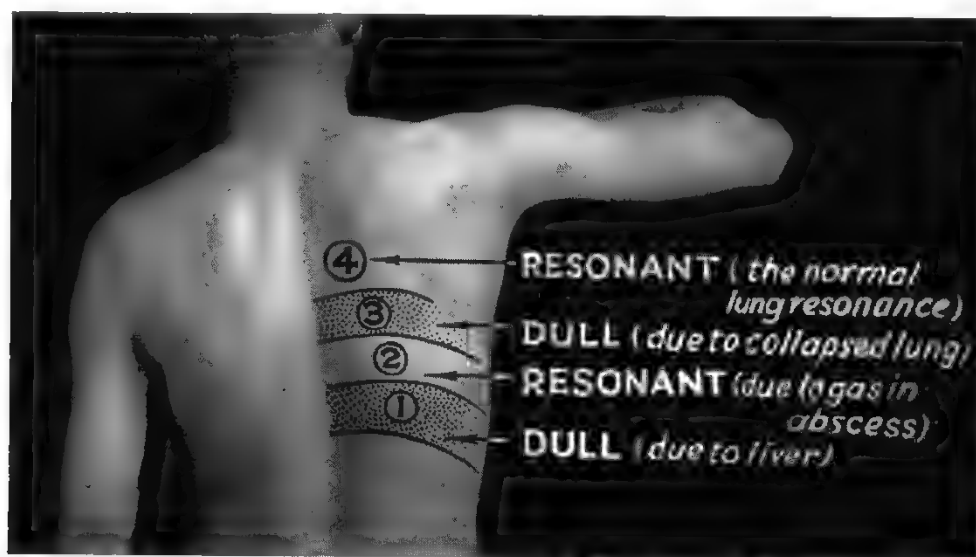


Fig. 573.—Subdiaphragmatic abscess containing gas. The four areas of differential percussion.

*of atelectasis at the base of the lung favour, rather than hinder, the diagnosis of subphrenic abscess.*

*Percussion.*—When gas is present, percussion may yield the classic four areas of altered resonance (Fig. 573), which are, from below upwards: (1) Dull—due to liver; (2) Resonant—due to gas\* in the abscess; (3) Dull—due to collapsed lung or pleural effusion; (4) Resonant—the normal lung resonance. Unfortunately it is not usual to find this picture.

\* This gas, when demonstrated radiologically, provides confirmatory evidence.



Ultimately diagnosis must rest with an exploratory procedure, usually after a period of antibiotic therapy and observation.

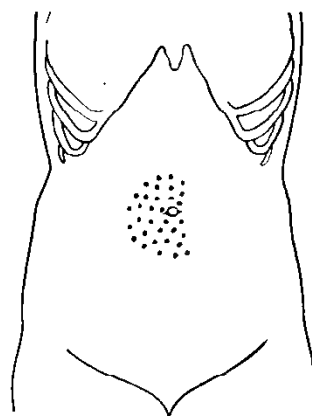
**Pylephlebitis (Portal Pyaemia).**—In the early stages pylephlebitis is difficult to differentiate from subdiaphragmatic abscess. Both lesions arise as a complication of inflammatory conditions of organs (notably the vermiform appendix) that drain their venous blood into the portal system, and both lesions give rise to a swinging temperature.

In pylephlebitis the patient soon develops a slightly jaundiced tinge. Rigors are usual. When the liver is examined it will be found to be enlarged and often tender. As a rule, pylephlebitis becomes manifest a few days *after* (it may have been present before) the inflammatory focus which gave rise to it has been removed. When there is no known focus of infection the rectum should be examined for thrombosed inflamed haemorrhoids, which, however, are a most unusual cause of this condition. If the patient (with antibiotic help) can combat the onslaught of this often fatal disease, one or more liver abscesses may form. The signs then do not differ from those of an amoebic liver abscess (*see* p. 329).

### ABDOMINAL AND PELVIC LYMPHADENITIS AS A CAUSE OF ACUTE ABDOMINAL SYMPTOMS

**Acute Non-specific Mesenteric Lymphadenitis** is, in the first decade of life, as common as acute appendicitis. The incidence of the disease falls abruptly after

*Fig. 574.*—Usual sites of pain in acute non-specific lymphadenitis. Note the large area and compare it with the relatively circumscribed area of acute appendicitis (*see* Fig. 549 A, p. 297).



the age of 6 years; beyond the age of 15 years the diagnosis should not be entertained.

**Pain.**—There are spasms of severe general abdominal colic, usually referred to the umbilicus, with intervals of complete freedom that never appertain in obstructive appendicitis.

**Vomiting.**—As a rule vomiting occurs at the very outset of the attack, and synchronizes with the onset of abdominal pain—in this it differs from acute appendicitis, in which pain precedes vomiting.

**Temperature** averages 38° C. but it varies, as it does in acute appendicitis.

**Pulse-rate** is slightly increased. It is never unaltered, as is the case in some examples of acute obstructive appendicitis in the early stages.

**ABDOMINAL EXAMINATION. Inspection.**—When asked to do so, the child maps a relatively wide inconstant area rather more medial and higher than in appendicitis (*Fig. 574*) to indicate the site of the pain. With the passing hours the site of the pain remains constant. Compare this with the shift of the site of pain in appendicitis (*see* p. 297).

**Palpation.**—True rigidity is not present. The tensing of the abdominal musculature is due to muscular resistance. If the child's attention is diverted, the resistance ceases. This does not occur in appendicitis. Having broken through the muscular resistance, and exercising gentleness and patience, endeavour, by deeper and deeper palpation just below and to the right of the umbilicus, to feel the enlarged lymph-nodes. In about 25 per cent of cases one or more nodes can be imprisoned between the palpating fingers and the promontory of the sacrum as discrete, mobile lumps, each the size of a grape, that slither beneath the fingers.

**Rebound tenderness** is not present or, at the most, only very slight pain is elicited.

**Klein's Sign of Shifting Tenderness.**—After laying the patient on the left side for a few minutes the maximum site of tenderness moves to the left of the original site. Even if positive, this does not rule out the possibility of acute Meckelian diverticulitis, a rarity.

**Hyperaesthesia** is not present, as it may be in unperforated acute appendicitis.

**RECTAL EXAMINATION** is almost invariably entirely negative. Exceptionally, tender enlarged lymph-nodes can be palpated high in the rectovesical pouch.

The differential diagnosis between acute non-specific mesenteric lymphadenitis and acute appendicitis is sometimes quite straightforward: at others it is extremely difficult. Helpful signs are that in the former there is frequently an antecedent respiratory infection, and at times the disease is mildly epidemic and in about half the cases the face shows a malar flush, with or without circumoral pallor (Fitzgerald). In doubtful instances several hours observation (preferably in hospital) resolves the matter. In acute appendicitis localized tenderness in the region of McBurney's point becomes obvious in this time.

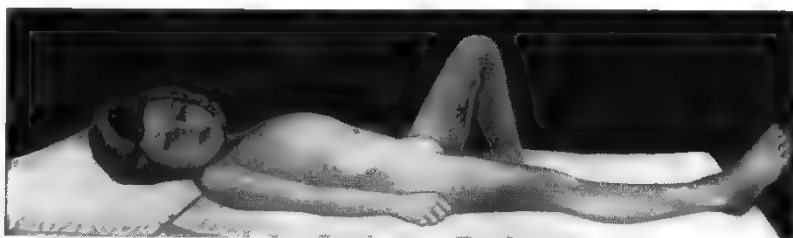


Fig. 575.—A case of suppurating deep iliac lymph-nodes. The amount of flexion of the hip is not exaggerated.

**Suppurating Deep Iliac Lymph-nodes** are a diagnostic Waterloo. Often psoas spasm is in evidence; the thigh is flexed (Fig. 575). This, combined with pain and tenderness in the *right* iliac fossa, leads to a diagnosis of appendicitis, while on either side purulent arthritis of the hip-joint or osteomyelitis of the upper end of the femur may be suspected. Sometimes the superficial inguinal lymph-nodes are palpably enlarged, but this is by no means part and parcel of this clinical entity. Hip-joint diseases can be eliminated by putting the joint through the routine movements, when it will be found that all with, perhaps, the exception of full extension (psoas spasm) are unimpaired, provided they are elicited cautiously. Deep pressure over the upper end of the femur does not cause pain. On inspection a fullness may be perceived above the inguinal ligament. However, whether visible or not, the characteristic sign is a firm, tender palpable lump tending to occupy a position rather nearer the anterior superior iliac spine than the tubercle of the pubis.

The differential diagnosis from an appendix abscess can be extremely difficult. The whole of the lower limb, commencing with the toes and the clefts between the toes, must be scrutinized for a focus of infection. Remember to look at the heel and the back of the limb, as well as the more accessible parts (e.g., the perianal region). The finding of such a focus in the shape of a scratch or a sore is very significant and is found in about three-quarters of cases.

In the tropics filarial infestation and tropical pyomyositis are causes.

## ACUTE INTRA-ABDOMINAL CONDITIONS PECULIAR TO THE FEMALE

**Ectopic Gestation** is the most common cause of intraperitoneal haemorrhage. The condition terminates abruptly in one of two ways and consequently the symptoms come on suddenly: (1) The ovum is aborted through the abdominal ostium of the Fallopian (uterine) tube; (2) The Fallopian tube or the broad ligament in which the ovum is situated ruptures. In the latter, which is less common, the bleeding into the peritoneal cavity is violent, and produces signs of internal haemorrhage so severe and sudden that they approach the classical picture (*see p. 44*). In tubal abortion there is a series of smaller bleedings, each accompanied by a recrudescence of pain, and often a *feeling* (in only a fifth of cases does the patient actually faint) of faintness, which tends to pass off as the vasomotor system adjusts the blood-pressure. The physical signs will vary greatly according to the stage at which the patient is examined.

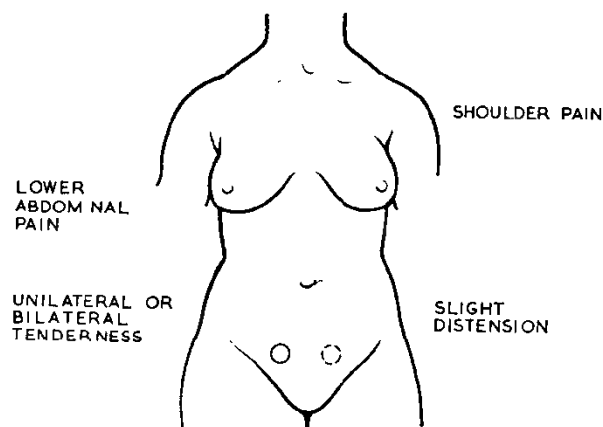
It will be assumed that the patient has had two or three attacks of pain, that the lower intra-abdominal viscera are bathed in blood, but the signs of shock are not yet in evidence.

Pain is often sharp and stabbing; as a rule the pain is situated in the pelvis, frequently it radiates to the rectum—the so-called ‘lavatory’ sign.

**Pulse-Temperature Ratio.**—An increased pulse-rate with a normal or slightly subnormal temperature is characteristic. In only a few cases is the pulse-rate below 80 beats per minute. Should the haemorrhage cease spontaneously, in an hour or more, the temperature becomes slightly elevated.

**Shoulder Pain** usually does not come on until the haemorrhage is considerable and it occurs in about 30 per cent of cases. It may be referred to one or both shoulders and may be complained of only after the foot of the bed has been raised (to combat the shock).

*Fig. 576.*—Only when a clinician becomes ectopic-minded are cases of tubal abortion and tubal rupture likely to be diagnosed early. Of cardinal significance, the history of a missed period is too often lacking to be a sheet anchor.



**ABDOMINAL EXAMINATION.**—*Inspection.* Slight distension often is in evidence. It is due to meteorism, which comes on early when there is blood in the peritoneal cavity. The abdomen moves well with respiration.

On a few occasions a blue discoloration of the umbilicus has been noted: this is a most exceptional phenomenon, but it should be looked for in passing (Cullen's sign, *see p. 257*).

*Palpation.*—There is absence of rigidity during the first few hours, but invariably deep tenderness is present in one or both hypogastric areas (*Fig. 576*). The rebound sign will be positive on the affected side at an early stage.

**Percussion.**—*Shifting dullness* should be sought (see p. 250). If sufficient fluid blood is in the peritoneal cavity the sign will be positive.

**VAGINAL EXAMINATION.**—Vaginal bleeding is usual; this is sometimes darker and thicker than the normal menstrual flow ('prune juice blood'). As the patient is pregnant the cervix feels softer than normal: gentle tilting of the cervix causes pain—a most valuable sign. All the fornices are tender, and this is of considerable importance, as in inflammatory conditions tenderness is present only in the posterior and one or both of the lateral fornices (Connell).

The patient should be questioned about the dates of her monthly periods. The history of a missed period is of the greatest possible significance, but it is by no means always obtainable.

If 'ruptured ectopic' is doubtful a rising pulse-rate and a falling blood-pressure are points in favour of the diagnosis. Quarter-hourly readings are advisable.

**Ruptured Lutein Cyst.**—The patient is an unmarried, or young married, woman. The pain occurs half-way between two menstrual periods ('mittelschmerz'\*). Particularly when right-sided, a ruptured lutein cyst is extremely difficult to differentiate from acute appendicitis. Unlike the latter, the pain *commences* in the iliac fossa and tends to decrease in a matter of a few hours. In exceptional cases intraperitoneal haemorrhage is considerable, and the signs simulate those of tubal abortion.



Fig. 577.—The swelling caused by a twisted ovarian cyst (right side). Inset, the specimen removed at an emergency operation.



Fig. 578.—Areas of deep tenderness in acute salpingitis.

**Twisted Ovarian Cyst.** —A very sudden onset of abdominal pain, followed by attacks of lower abdominal pain of a colicky nature recurring at frequent intervals, together with repeated vomiting, is the usual history. If a lump is present (Fig. 577), the diagnosis is tolerably simple. Overlying rigidity tends to mask the lump, which, if small, is situated entirely within the pelvis.

Before examining the patient bimanually, either per vaginam or per rectum according to circumstances, always have the bladder emptied by a catheter.

**Torsion or Degeneration of a Uterine Fibroid.**—The symptoms and clinical findings are similar to the above; the finding of an obviously enlarged fibroid uterus on vaginal examination is suggestive but remember that fibroids are often coincidental with other causes of the acute abdomen.

\* *Mittelschmerz*. German, *mittel* = middle + *schmerz* = pain.

**Acute Salpingitis.**—In two-thirds of cases the illness commences at the time of menstruation, or during the first week after abortion or delivery. The salient points in the diagnosis of acute salpingitis are as follows: (1) A vaginal discharge whether of recent onset or an exacerbation of a long-standing discharge is invariable; (2) The pain of acute salpingitis *commences* in the iliac fossa, not in the epigastrium or around the umbilicus as in appendicitis; (3) Usually the temperature is higher than that commonly found in acute appendicitis, but this should not bias the diagnostician unduly; (4) Dysuria is a frequent symptom—scalding micturition with increased frequency is suggestive; (5) Although there are exceptions, abdominal rigidity is not much in evidence; (6) Maximum tenderness is fairly constantly low down, i.e., just above the inguinal ligament; frequently it is bilateral (*Fig. 578*); (7) Rebound tenderness is often positive in one or both of these areas. If only positive on the right side, pelvic appendicitis is not excluded.

**Vaginal Examination.**—The uterus will be found to be somewhat fixed and movement of it causes extreme pain. When the infection occurred during the puerperium or following abortion the uterus will be found to be enlarged. In cases following abortion the cervix is softer than normal. It is only with the subsidence of the acute stage that a unilateral or bilateral thickened, swollen tubal mass can be distinguished.

**Tubo-ovarian Abscess.**—In spite of the fact that the use of antibiotics has resulted in decrease in the incidence and severity of pelvic inflammation, cases still occur quite frequently. The condition is met with during the reproductive period. Pyrexia is a feature. The patient complains of pain on the side of the abscess. In about 50 per cent the condition is bilateral. Intraperitoneal rupture is a complication to be borne in mind. When right-sided rupture is impending or actual the condition is difficult to differentiate from pelvic appendicitis. A previous vaginal discharge is suggestive of tubo-ovarian abscess. When rupture occurs, there is very severe pain in the lower abdomen, often followed by rigors, and less frequently by vomiting. The degree of accompanying shock is proportional to the amount of pus liberated.

#### SOME EXTRA-ABDOMINAL CONDITIONS THAT MIMIC ACUTE INTRA-ABDOMINAL DISEASE

In the course of the preceding demonstrations on acute intra-abdominal conditions the reader's attention has been directed to several extra-abdominal conditions that mimic 'the acute abdomen'. Others simulating acute abdominal conditions are:—

**Coronary Occlusion.**—Myocardial infarction often causes upper abdominal pain. Men are more susceptible to this condition than women: usually the victim is past 40 years of age. The onset is sudden and the pain severe: it is located in the lower sternal region and radiates to the epigastrium. Cardiac pain often radiates to both shoulders and down the left arm. The patient is apprehensive and moves about in bed, which is in contrast to one who is stricken with an acute intra-abdominal catastrophe. Pain of gall-bladder origin is most often confused with cardiac pain, be it angina pectoris or that due to coronary occlusion; a factor that heightens the difficulty in differentiation is that occasionally gall-stones give rise to reflex precordial pain identical with that produced by coronary thrombosis.



**Cyanosis.**—Like ultra-acute pancreatitis, the patient may have a cyanotic tinge, but, unlike acute pancreatitis, the patient suffering from coronary occlusion is often dyspnoeic.

**Observe the Veins of the Neck.**—In cardiac failure they are distended or at least full.

The *Electrocardiogram* usually shows characteristic changes.

**Diaphragmatic Pleurisy** (including Bornholm\* Disease).—When there are no physical signs to be found on examination of the thorax, as may happen in diaphragmatic pleurisy, the differentiation between it and upper abdominal surgical conditions, e.g., cholecystitis, sealed-off perforation of a peptic ulcer, becomes exceedingly difficult. Helpful signs are as follows:—

1. In pleuropneumonia with abdominal pain, while the skin in the region of the referred pain is hyperaesthetic, pressure over the area affords relief of the pain.

There is little, if any, restriction of respiratory movements of the abdominal wall in pleuropneumonia (Birch).

2. In referred abdominal pain attending the diaphragmatic inflammation of pneumonia, abdominal rebound tenderness is absent.

**Herpes Zoster.**—When the pain radiates *from* the back along one or more spinal nerves of the lower thoracic segments *to* the midline anteriorly, herpes zoster should spring to the mind.

The pain, which on the right side has been mistaken for that of acute cholecystitis, is rather severe and usually it is unremitting: it precedes the skin eruption (*Fig. 579*) by several days. It is in the pre-herpetic stage of herpes zoster that confusion with visceral disease occurs. The following are the most helpful differentiating signs:—

1. *Skin hyperaesthesia* occurs along the whole course of the affected nerve or nerves.

2. *Herpes zoster* usually follows a respiratory infection, the constitutional symptoms are mild, and rarely does the temperature reach 38° C.

3. *Rebound tenderness* is absent.

**Spinal Extradural Abscess** (*see p. 226*) is a considerably rarer condition in which root pain mimics abdominal disease.

### ABDOMINAL AORTIC CATASTROPHES

A patient, usually a middle-aged or elderly male, presents in extremely severe abdominal or lower chest pain, and markedly shocked. Apart from the relatively



*Fig. 579.*—Eruption of herpes zoster, lower thoracic spinal nerves. Two days previously the patient had been admitted to hospital with a diagnosis of cholecystitis.

\* Named from the Danish island, Bornholm.

commonly occurring conditions, namely, perforated peptic ulcer, coronary thrombosis, and acute pancreatitis, there are three uncommon possibilities, the differential diagnosis of which is important, as surgical treatment is feasible. Of these the first is most often encountered, the second is uncommon, and the third, *spontaneous rupture of the oesophagus* (see p. 200), is rare.

**Ruptured or Leaking Aortic Aneurysm.**—In passing, it should be noted that, with the disappearance of the ravages of untreated syphilis, the abdominal aorta has become easily the commonest site of aneurysm. Before rupture, the aneurysm (which is almost invariably situated below the renal arteries) is found as a pulsating epigastric swelling occupying the midline but extending rather more to the left. The patient is usually hypertensive, but when leakage starts the blood-pressure falls catastrophically. He is also manifestly anaemic and complains of severe central abdominal pain radiating through to the back.

**Abdominal Signs.**—If leakage has been slight the aneurysm is still palpable. As leakage gives way to frank rupture variable rigidity is found, usually more marked on the left side. A mass (blood-clot) in the left iliac fossa resembles that found with a pericolic abscess due to diverticulitis (see p. 303).

**Arterial Pulses in the Lower Limbs** (see p. 389).—Are reduced or absent if the rupture has diverted most of the blood-flow through the aorta into the retro-peritoneal and peritoneal spaces.

**Aortic Dissecting Aneurysm.**—A severe degree of hypertension (of which the patient or a relative may be aware) initiates the dissection which usually commences in the aortic arch. The pain, which is excruciating, thus commences in the retrosternal region, radiates between the shoulders, and spreads into the upper abdomen as the dissection proceeds downwards.

The *signs of shock* are apparent but the blood-pressure may lie within normal limits, which is low for the particular hypertensive patient.

**Abdominal signs** are absent until the aneurysm ruptures into the retroperitoneal space with the patient's demise within a few minutes.

**Anuria** is a sign that the dissection has spread to involve the renal arteries.

**Arterial Pulses in all Four Limbs.**—Owing to partial blockage of the main branches of the aorta by the dissection, the blood-pressures (as measured by a sphygmomanometer) in the right and left arms differ. Similarly, the femoral pulses may be unequal. A unique sign is that, if observed over a period of an hour or two, these differences alter as the limit of the dissection advances. Ultimately complete blockage of the arterial blood-supply of one or more limbs is caused, the condition simulating an embolus (see p. 395) in this respect.

### THE ACUTE ABDOMEN IN THE TROPICS

A knowledge of endemic disease is necessary as the tropical diseases found in any particular area vary widely. In addition, non-tropical conditions differ inexplicably in their frequency, e.g., the high incidence of intussusception in Nigeria, and of volvulus of the sigmoid colon in Ghana and Uganda (see p. 310).

**Amoebic Liver Abscess** is a complication of amoebic dysentery. It should be noted especially that as amoebiasis occurs in all parts of the world, it is not essential for a sufferer from this condition to live, or have lived, in a tropical or a subtropical zone, although such residence so greatly favours a tentative diagnosis as to warrant the term 'tropical abscess of the liver'. Adult males are the usual sufferers.

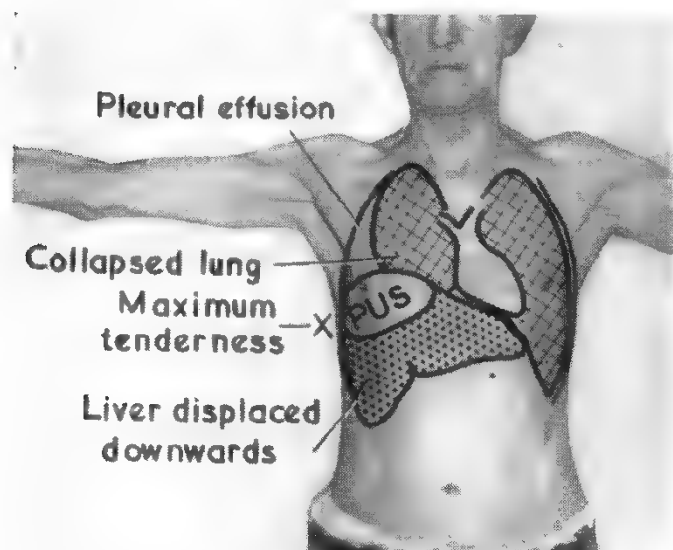
**Pain** in the liver area is dull and constant, worsened by alcohol and also so much increased by jarring that while walking or riding in a vehicle the patient supports the right side with the hands when he expects a jar or vibration. When present this sign is highly characteristic.

**Pyrexia and Rigors** with profuse sweating at night are the rule.

Other signs are depicted in *Fig. 580*. Radiography, sigmoidoscopy, and aspiration of the contents of the abscess (chocolate-coloured pus) are required to establish the diagnosis.

The patient may not come under observation until soon after the abscess has ruptured (*a*) into the peritoneal cavity (acute peritonitis with board-like rigidity), (*b*) into the pleural cavity (empyema), or more happily, (*c*) into the lung (chocolate-like pus expectorated), or (*d*) into the intestine.

**Amoeboma** (an inflammatory mass due to an amoebic granuloma).—May occur in the caecum simulating an appendix abscess, or in the rectum where it is liable to be mistaken for a carcinoma. The response of both to emetine is so rapid as to constitute a therapeutic test.



**Fig. 580.**—Physical signs of an amoebic liver abscess (most common site depicted). Basu notes that the right lower intercostal spaces may bulge and sometimes exhibit pitting oedema (due to the underlying abscess) and also that an abscess in the right lobe may present as a mass in the region of the gall-bladder. An abscess of the left lobe may cause an epigastric swelling.

**The Typhoid Abdomen.**—It may, or may not, be known that the patient is suffering from typhoid fever. When perforation of the small bowel occurs the poor general condition of the patient usually modifies the course of the resultant peritonitis so that the condition resembles that of postoperative peritonitis (*see* p. 319) rather than that of acute peritonitis due to flooding of the peritoneal cavity in perforated peptic ulcer (*see* p. 303).

**Intestinal Obstruction due to Worms.**—Obturation by a mass of worms may, particularly in children, cause incomplete intestinal obstruction. An abdominal mass corresponding to the obturating bolus of worms may be palpable. If this condition is suspected, the stools and the vomitus (if any) should be examined for the usual cause, *Ascaris lumbricoides*. If found, remember that the abdominal pain may be due to peritonitis, the worms having penetrated the intestinal wall, and look for signs of this (*see* p. 318).

**Rupture of an Enlarged Spleen due to Tropical Disease.**—The enlarged spleen in the tropics is more friable than usual and rupture (*see* p. 332) is common. Delayed rupture in particular is relatively frequent.

**Oriental Cholangiohepatitis** (*see* p. 237).

**Tropical Pyomyositis** (*see* p. 253).

#### ABDOMINAL CRISES OF MEDICAL CONDITIONS

If the patient appears to be in acute abdominal pain, but the four preliminary signs mentioned on pp. 295–6 are lacking (particularly the rebound sign), the conditions mentioned in this section must be considered.

**Diabetic Crisis.**—Abdominal pain sometimes occurs when coma is impending. Thus if routine examination of the urine shows ketones and sugar, the diabetes should be treated urgently. If the pain is not relieved thereby, or if the pain is typical of an acute abdominal condition, remember that it is much commoner to come across an 'acute abdomen' in a diabetic than a crisis. However, in the former circumstances, valuable time has not been wasted; it is necessary to control the diabetes before an operation is undertaken.

**Porphyria.**—The abdominal crises, which are characterized by violent intestinal colic with constipation, are liable to be precipitated by the administration of barbiturates or sulphonamides, to which these patients have an idiosyncrasy. The abdomen is distended, rigidity being absent. On examining the left hypochondrium, the spleen is occasionally found to be enlarged. The correct diagnosis is made when a specimen of urine left over-night is noted to have become a characteristic dark-red colour (*see* Fig. 598, p. 345). There are conclusive laboratory tests for porphyrinuria.

**Hyperlipidaemia.**—Attacks of abdominal pain, often left-sided and sometimes associated with a raised serum amylase (*see* p. 307), occur in sufferers from this group of diseases which are often familial. Clues are that the patient may show arcus senilis (*see* p. 5) and/or xanthomatosis (*see* p. 71). Turbidity of the blood plasma due to an excess of fat globules supports the diagnosis but confirmatory laboratory tests are necessary.

**Malaria.**—In the tropics, or in persons who have resided or passed through the tropics or subtropics, abdominal cramps with diarrhoea and vomiting may be due to malaria, or pain in the left upper abdomen may be due to destruction of red blood-cells by the spleen which is often, but not always, palpably enlarged. In such patients examination of a blood-smear for the parasite is essential.

**Sickle-cell Anaemia.**—West Indians and others of African descent are liable to similar episodes of destruction of the abnormal red cells in the spleen (which may be enlarged in children) or blockage of mesenteric blood-vessels with abdominal pain. Painless haematuria may be the presenting symptom. Leg ulceration (*see* p. 541) or dactylitis (*see* p. 497), if present, is a clue. Blood examination again will suggest the diagnosis. In the tropics an unnecessary operation on a patient with this disease is almost as foolhardy as such an operation in the following condition.

**Haemophilia.**—The male patient who states, or whose parents state, that he is a haemophiliac and is complaining of abdominal pain should be regarded as suffering from a retroperitoneal haematoma unless there is extremely strong clinical and ancillary evidence to the contrary. To operate unnecessarily on a haemophiliac is the height of surgical folly and the decision to open the abdomen should not be made by the person for whom this book is intended. Suffice it to state here that the advice of a haematologist must be sought.

**Acholic Jaundice** (*see* p. 237).

**Tabetic Crisis** (*see* p. 304).

#### THE ABDOMINAL MALINGERER

We are not concerned here with the patient (usually female) who complains of chronic abdominal pain which, although vaguely reminiscent of one or more of the conditions discussed in Chapter XVIII (NON-ACUTE ABDOMINAL CONDITIONS), on careful investigation proves to have nothing detectably wrong. Many in this category are relieved of their pain by a negative investigation, and those who are not might well be termed 'neurotic' provided the clinician is absolutely certain that no disease is present. The problem is not urgent in contradistinction to the following category which occurs almost invariably in males.

**Munchausen's Syndrome.**—For a clinician to jump to a conclusion that the patient before him is suffering from this because there are several scars on the abdomen and the symptoms are out of proportion to the physical signs, is so dangerous that it would be far better if he had never read about it. The hoaxer who exhibits Munchausen's syndrome is sometimes skilful, but such a patient can never reproduce the sounds of turbulent peristalsis: neither can he produce fluid levels on an erect radiograph of his abdomen. There are three varieties of Munchausen's syndrome (Asher) the abdominal type, the bleeding type, and the type who specializes in faints, fits, and palsies. Thus two out of three of these psychopathic malingerers are likely to cross the surgeon's path.

Often the patient says that he is on a long journey to explain his presence at a hospital not in the vicinity of his normal abode (Angell). This hinders the clinician in ascertaining the details of previous operations.

## CHAPTER XXIII

## ABDOMINAL AND PELVIC INJURIES

UNDER this heading 'closed' injuries, as opposed to wounds, will be considered, although it may be mentioned in passing that correct diagnosis in the case of a penetrating wound of the trunk can only be attained by thorough exploration in the operating theatre. Cursory stitching of the skin in the casualty department leads, on occasion, to serious errors. When a patient has received an injury to his trunk, as often as not there is little to guide the clinician in the shape of external bruising. The problem is to decide as quickly as possible whether the patient has sustained an intra-abdominal lesion. This is often a difficult matter, particularly when shock is severe. In such circumstances the correct procedure is to treat the shock and to examine and re-examine the patient at frequent intervals.

Bear in mind that acute abdominal pain and rigidity can be due to irritation of the lower intercostal nerves by fractured ribs. It is essential therefore to examine the thorax carefully, not only for the presence of a fractured rib or ribs, but for thoracic complications arising therefrom. A lacerated lung causing a pneumothorax or a haemopneumothorax can produce symptoms that simulate closely those of a serious intra-abdominal lesion. Another pitfall is the presence of an unsuspected lesion of the spinal cord which may cause the most excruciating abdominal pain (Schrire).

In this mechanized era, if a patient has sustained a head injury—particularly if that injury is the result of a road accident—it is of fundamental importance to search for evidence of injury elsewhere. In particular the thorax, abdomen, and pelvis must be examined. Especially with an unconscious patient, one such negative examination must not lull the clinician into thinking that he has done his duty in this respect. The patient must be re-examined when he has regained consciousness.

## TRAUMATIC HAEMOPERITONEUM

**Rupture of the Normal Spleen.**—This, the most common injury caused by non-penetrating violence to the abdominal wall, can be divided advantageously into three groups: (1) The patient never rallies from the initial shock; (2) Initial shock—recovery from shock—signs of ruptured spleen; (3) The signs of an intra-abdominal disaster are delayed for more than 24 hours.

**1. The Patient succumbs rapidly.**—A comparatively rare result unless there are associated injuries. Complete avulsion of the spleen from its pedicle is most likely to give rise to this catastrophe.

**2. Shock—Immediate Signs of Rupture.**—This is by far the largest group—more than three-quarters of all cases belong to it. There are signs that point to an intra-abdominal disaster. It is not always possible to state precisely which organ is damaged, but in the majority of instances the physical signs point clearly to the spleen as the site of injury.

**GENERAL SIGNS.**—As a rule the patient is pale (*see Fig. 96, p. 45*).



*Pulse-rate.*—In early cases the pulse may not rise above 90 beats a minute. The reason is that the initial shock and the moderate haemorrhage from the spleen cause a temporary fall in blood-pressure, and during this time adequate clotting occurs to control the haemorrhage temporarily. Thus by the time the patient is first seen there may be little in the general appearance to arouse a suspicion of the true nature of the injury. The local signs therefore become correspondingly important.

*LOCAL SIGNS.*—In cases where the spleen is the only viscus injured, the pain is variable, tenderness slight but constant, the abdomen is soft, and bowel-sounds are present. If a rib or ribs are fractured, pain is increased.

*Rigidity* is present in more than half the total. Usually it is most pronounced over the left upper abdomen.

*Local Tenderness* is found very constantly in the same region.

*Meteorism* commences to appear about three or four hours after the accident; it is due to paralytic ileus (*see p. 319*).

*Shifting Dullness* in the flanks (*see p. 250*) is present fairly regularly.

*Referred Pain to the Shoulder* is a very valuable sign, and should be inquired for specially in cases of abdominal injury. Often the patient does not mention it unless asked. Sometimes there is hyperaesthesia in this area (Kehr's sign, *Fig. 581*). When



*Fig. 581.*—Kehr's sign. Often pain is referred via the phrenic nerve to the left shoulder when blood is in contact with the under-surface of the diaphragm. The sign is of especial significance after abdominal accidents, and should be inquired for and the test for hyperaesthesia applied.

rupture of the spleen (or of the liver) is suspected and other signs are doubtful, the patient should be asked to lie flat in bed on the back; then the foot of the bed is raised 0·5 m. Wait for 10 minutes. If the peritoneal cavity contains liquid blood it will gravitate towards the diaphragm, and frequently the patient complains of pain in one or other shoulder—usually the left. Test both shoulder areas for cutaneous hyperaesthesia. An obvious, but nevertheless a very useful, way of distinguishing referred shoulder pain from pain due to a shoulder injury is that in the referred type the pain is made no worse by movement of the joint or pressure over the site.

**3. The Delayed Type of Case.**—Following the accident, there is a period of comparative freedom from symptoms, which often is extremely deceptive. A navvy, aged 40, was hit in the upper abdomen by a pole. He fainted, but soon recovered sufficiently to walk to hospital, where he was examined and told to report the next day. On the morrow he felt better, and stayed at home. Five days later he was brought in with well-marked signs of internal haemorrhage, having collapsed at home a few hours before admission. Recovery followed splenectomy.

Delay of serious bleeding may be explained in three ways: (1) The great omentum, performing its well-known constabulary duties, shuts off that portion of the general peritoneal cavity in the

immediate vicinity of the spleen; (2) A bloody coagulum temporarily seals the rent; (3) A sub-capsular haematoma forms, and later bursts. It is probable that each of these three factors, at one time or another, temporarily arrests serious haemorrhage.

**Ruptured Liver.**—*The force of a blow necessary to rupture the liver is greater than that necessary to rupture the spleen*, consequently associated injuries are more common and make the diagnosis more difficult. Nevertheless, the salient physical signs of rupture of the liver are, in most respects, similar to those of a ruptured spleen. There are also three comparable types: (1) The patient rapidly succumbs; (2) Shock, recovery, more shock, signs of internal haemorrhage; (3) Delayed rupture.

The right lobe is involved five times more frequently than the left. More often than not one or more of the lower ribs on the right side and/or the transverse processes of the first two lumbar vertebrae are fractured. If the local signs point to a right-sided lesion there is no particular difficulty in differentiating a ruptured liver from a ruptured spleen. A special point is that when the rupture is in the central part of the liver, some of the bleeding occurs into the large radicles of the biliary tree so that liquid blood is carried along the bile-passages into the duodenum, and the patient may vomit blood.

**Laceration of the Mesentery.**—Haemorrhage from the mesentery is likely to be brisk, and if the tear is parallel to the gut the blood-supply to the intestine in the immediate vicinity of the tear is endangered. There are signs of a haemoperitoneum without any pointers to the liver or to the spleen. Early meteorism from bruising of the intestinal wall suggests that it is the intestine that is ruptured.

### INJURIES WITHOUT MASSIVE INTERNAL HAEMORRHAGE

These are just as dangerous as those belonging to the group that gives rise to internal haemorrhage; indeed, without early diagnosis and laparotomy the patient's chance of survival is negligible, for blood transfusion alone cannot help.

**Ruptured Intestine.**—In rupture of the small intestine, for several hours following the accident, in many cases there is no radiographic evidence of free subdiaphragmatic gas in the peritoneal cavity. Therefore do not rely on X-rays; repeated clinical examination remains the diagnostic sheet-anchor.

**Pointing Test.**—There is one sign of great value in ruptured intestine, and that is the pointing test. Ask the patient to point with one finger to where the pain is most acute or where it started. The patient may locate accurately the site of the perforation. This test, used in conjunction with Monks's method of intestinal localization (*Fig. 582*), is of signal value.

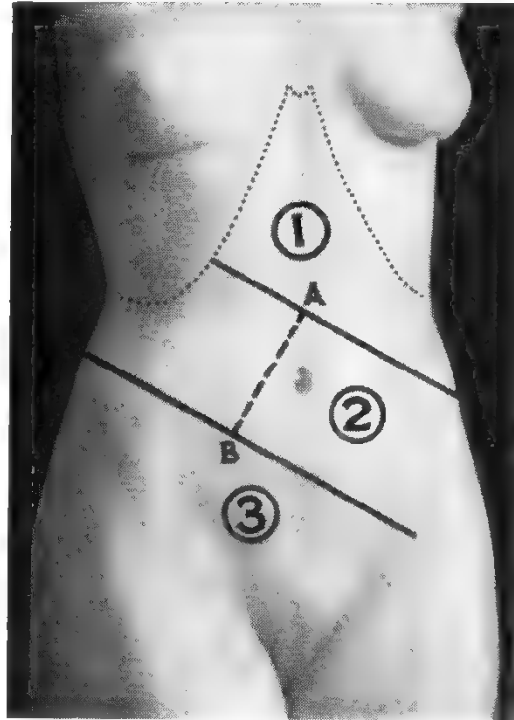
**London's Sign.**—The presence of 'pattern' bruising of the skin (i.e., an imprint of the clothing is noted on the skin) indicates that a crushing force sufficient to rupture the bowel against the vertebral column has been applied. This sign is a strong indication to carry out a laparotomy.

**Local Tenderness** is often the key to the site of the rupture. When a patient has been struck upon the abdomen and tenderness on pressure, and especially rebound tenderness, can be evoked in one special area, even in the absence of all other signs, if the tenderness persists for an hour the decision to open the abdomen on a diagnosis of rupture of the intestine should be made.

*Remember that the blow may be, and often is, a comparatively trivial one.*—The disparity between the force of the blow on the abdomen and the serious nature of

the intra-abdominal injury is greatest in cases of rupture of the intestine. The intestine is likely to rupture at a point where the blow impinges it against the vertebral column; consequently the relatively fixed first and last 0.5 m. of the small intestine are the most frequent sites for traumatic rupture. Early diagnosis is of paramount importance; if operation is delayed more than 6 hours the patient's chance of

Fig. 582.—Monks's method of intestinal localization. A, B. Line of mesenteric root. Parallel lines are drawn at right-angles to the extremities of this line, dividing the abdomen into three parts. Upper, middle, and lower compartments, indicated 1, 2, 3, contain, in most cases, the upper, middle, and lower thirds of the small intestine respectively.



recovery is greatly decreased. The time interval between the perforation and the development of peritonitis depends on the size of the rupture, on the character of the intestinal contents, and on whether the perforation occurs into the free peritoneal cavity. In cases where there is a tear of the jejunum large enough to admit a finger, the rigidity simulates that of an early perforated peptic ulcer.

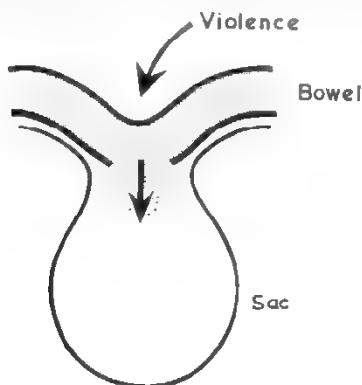


Fig. 583.—Remote external violence causes rupture of small bowel at the point where it abuts against the unyielding neck of the hernial sac.

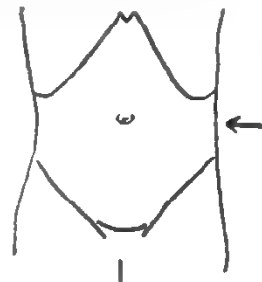


Fig. 584.—Injury to the kidney. Showing the flattening of the normal contour on the affected side.

**The Association of Inguinal Hernia and Traumatic Rupture of the Intestine.**—There is an important relationship between an uncontrolled inguinal hernia (usually on the right side) and traumatic rupture of the intestine. A portion of small intestine lying within an inguinal hernial sac can be ruptured by *direct* force applied to the hernia or, what is even more important to know, as pointed out by Aird, rupture

of the intestine can be caused by *indirect* violence (*Fig. 583*), in which event laparotomy, and not exploration of the hernia, must be carried out as soon as possible.

**Rupture of the Large Intestine** can be intra- or extraperitoneal. For obvious reasons, rupture of the large intestine, especially the intraperitoneal variety, is very lethal: fortunately it is comparatively rare. Very occasionally serious symptoms are delayed in the following way: the colon is bruised by the trauma, and slowly necrosis of the thin colonic wall occurs: suddenly the gangrenous portion perforates.

**Compressed-air Rupture of the Colon.**—This is the result of a damnable form of practical joke; a hose carrying air under considerable pressure is turned on near the victim's anus. The site of the rupture usually is the pelvic colon.

**Extraperitoneal Rupture of the Duodenum.**—The signs are often particularly misleading. After the initial shock has passed off, there is sometimes an interval of comparative freedom from symptoms. Then, usually following a meal or a drink, sudden pain, frequently situated in the lower thoracic and upper lumbar regions posteriorly, commences, and repeated vomiting occurs. Pain in the testes, particularly the right testis, due to extraperitoneal irritation of their nerve-supply, is sometimes present. If performed, the serum-amylase test will show a high reading. When the diagnosis is missed, and operation is not performed, or when the rupture is overlooked at laparotomy, extreme toxæmia supervenes. Should the patient survive, signs similar to those of a perinephric abscess (*see p. 353*) develop, incision of which is followed by a duodenal fistula.

**Rupture of the Pancreas** is a rare accident which is not infrequently accompanied by damage to other organs, particularly the spleen, duodenum, or jejunum. When the pancreas alone is injured, signs of a serious intra-abdominal injury are often lacking for some hours after recovery from the initial shock; then, owing to extravasation of pancreatic ferments, epigastric pain and repeated vomiting set in. That the organ has been severely damaged can be diagnosed only by a serum-amylase estimation which, if raised considerably, is good evidence of pancreatic (or duodenal) rupture. A pseudo-pancreatic cyst (*see p. 244*) may be the first intimation of the injury.

**Rupture of the Diaphragm.**—Most ruptures are on the left side of the diaphragm: the stomach and other hollow viscera then pass into the thorax so that abnormalities of percussion and auscultation are elicited on the left side of the thorax. Occasionally bowel-sounds heard through the chest wall help to suggest the diagnosis, which is frequently overlooked.

### INJURIES TO THE KIDNEY AND URETER

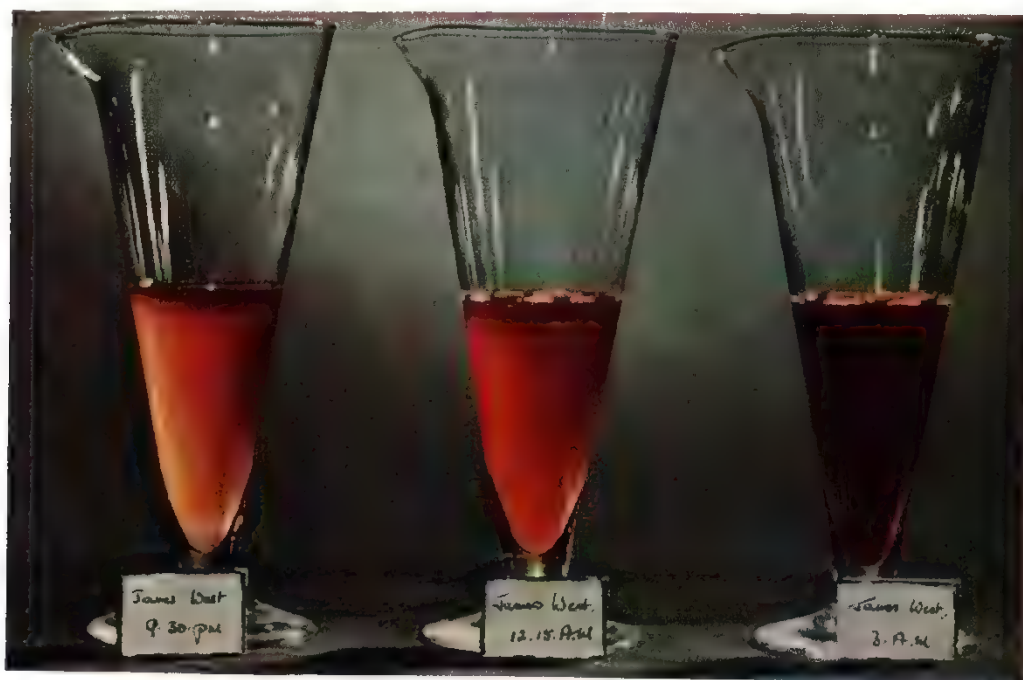
Renal injuries can be divided into slight, severe, and critical.

Slight injuries comprise those where the parenchyma is damaged without rupture of the capsule or extension of the laceration into the renal pelvis or a calix. Severe injuries are those where the capsule is broken and/or disruption into the renal pelvis or calices has occurred. An injury is termed critical when the vessels of the renal pedicle are torn or the kidney is shattered.

The absence of superficial bruising counts for nothing; it is present in only a small proportion of cases. The same may be said of the classic 'swelling in the loin' when the posterior aspect of the patient is inspected. Of greater general utility, as an early sign, is a flattening of the normal contour of the affected side when viewed from the front, provided the patient is spare (*Fig. 584*). Dullness of the percussion note lateral to the outer border of the rectus, as compared with the opposite side, is often a sign of value, whilst rigidity of the anterior abdominal wall on the affected side is present constantly in cases of ruptured kidney. Owing to the greater mobility of the kidney in females, as well as to the somewhat more sheltered life of women, and possibly to the protection afforded by the wearing of corsets, the relative incidence of injuries in adult men and women is 10:1.

**Haematuria.**—This cardinal sign of a damaged kidney may not make its first appearance until some hours after the accident. In quite a large proportion of cases the urine voided soon after the accident is clear. The second sample, however, shows blood and urine intimately mixed.

In all cases the urine should be saved and placed in glasses bearing a label indicating the time of voiding (*Fig. 585*). It is then possible to compare one sample of urine with a later specimen, and thus to estimate whether the bleeding is progressive. If, after the initial examination, it is decided that no immediate operation is



*Fig. 585.*—Injury to a kidney. The urine is saved, and placed in glasses labelled with the time of passing. In this way one sample of urine may be compared with a later specimen, and an estimation can be formed as to whether the bleeding is progressive or not.

necessary, the patient is made as comfortable as possible, shock is treated (if necessary), arrangements are made for the pulse to be recorded quarter-hourly, and the clinician revisits the patient as often as the gravity of the case demands.

Rarely, macroscopic haematuria ceases within a few hours; this, of course, is likely when the injury is trivial. Nevertheless, one must not jump to this conclusion, for cessation of haematuria occurs also when the ureter becomes occluded by blood-clot. Haematuria is entirely absent in renal injuries only when the renal pelvis is avulsed from its ureter, a rarity.

**Severe Delayed Haematuria.**—A sudden profuse haematuria may occur (usually between the third and the fifth days) in a patient who appeared to be progressing favourably up to that time. The determining factor is probably some movement on the part of the patient which dislodges a clot in the renal pelvis (*haematurie tardive*, Tuffier).

**Residual Haematuria** may be the cause of some anxiety after nephrectomy has been performed for ruptured kidney. Postoperatively blood-stained urine continues to be passed and one wonders whether the remaining kidney is injured also. The explanation is that urine becomes stained by washing over clots that are present in the bladder. Doubtless this is also the explanation of cases of prolonged haematuria following renal injury.

**Clot Colic.**—Two different clinical conditions are included under this heading:



1. *Ureteric colic* is not very common, and when present usually occurs within 48 hours of the accident. The passage of clots down the ureter gives rise to pain radiating from the loin to the groin less severe than that produced by a calculus.

2. *Bladder colic* is much more frequent. It occurs generally between the third and fifth days after the accident, and is due to the passage of blood-clot from the bladder. The pain is considerable, and is referred to the glans penis in males.

**Meteorism.**—In many cases of severe renal injury abdominal distension comes on within 36 hours of the accident, and may give rise to difficulty in precise diagnosis. On rectal examination ballooning (*see* p. 286) is found, suggesting that this phenomenon is reflex in origin.

**Perinephric Haematoma** should be suspected if there is even a slight flattening of the normal contour of the loin (*see* Fig. 584). Rarely is abdominal relaxation sufficient to permit accurate palpation of the renal region, although when perirenal bleeding is extensive, a mass can be felt in spite of the overlying rigidity. In patients treated expectantly, a haematoma exceptionally causes a bulging in the loin. More often the blood tracks retroperitoneally to the iliac fossa, where a swelling is felt. On occasion the extravasated blood follows the course of the spermatic artery and gives rise to a thickening of the spermatic cord and to swelling and ecchymosis of the scrotum of the same side after a day or two.

**Dual Rupture of the Spleen and Left Kidney.**—A variable degree of shock is present in all but very slight injuries to the kidney. When shock is profound, and fails to respond quickly to the treatment, if there is no more obvious injury to account for it, a concomitant intraperitoneal lesion should be suspected, and the commonest dual lesion is rupture of the spleen and the left kidney.

### FRACTURE OF THE PELVIS

Clinically there are two varieties: firstly the isolated fracture without damage to the urinary organs and relatively little blood-loss; secondly, a double fracture with marked displacement of the pelvic bones due to shattering of the pelvic ring. Blood-loss is severe, leading to shock, and injury to the bladder or urethra is possible and, with severe disruptions, likely. With the latter, also look for evidence of sciatic-nerve injury (*see* p. 421).

When a fracture is present transverse compression (*Fig. 586*) and distraction (*Fig. 587*) of the pelvis are likely to produce acute pain. The genitocrural fold is explored by following the bony margin of the ischiopubic ramus (*Fig. 588*).

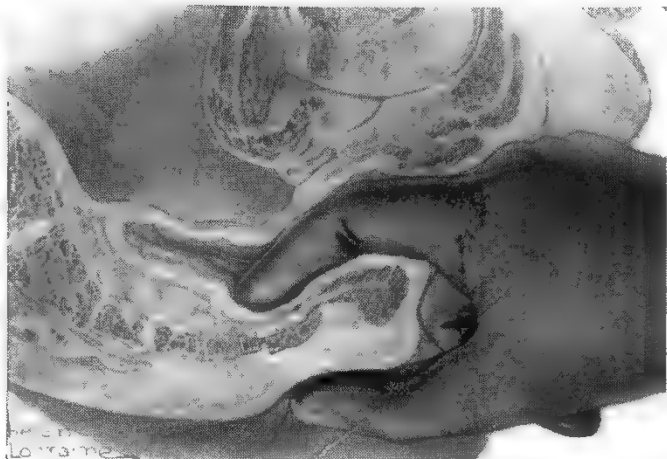
A rectal examination may yield valuable information, particularly in cases of fracture of the coccyx. *Fig. 589* shows the technique of examining for this fracture.

### RUPTURED BLADDER AND URETHRA

The prelude to the examination of an injury of the trunk should be an inquiry whether the patient has passed urine since the accident. For obvious reasons the importance of the rule reaches its zenith in injuries to the pelvis. Rupture of the bladder can be intraperitoneal, extraperitoneal, or both.

By reason of the ever-increasing number of road accidents, cases of fractured pelvis complicated by rupture of the bladder have become more common. Of these, the rupture is extraperitoneal in 80 per cent of cases. Conversely, as a result of increased sobriety, cases of intraperitoneal rupture of the bladder due to

## IS THE PELVIS FRACTURED?

*Fig. 586.—Compression.**Fig. 587.—Distraction.**Fig. 588.—Palpating the ischiopubic ramus.**Fig. 589.—Examining for a fractured coccyx.*

a blow upon the abdomen have become less common. Intraperitoneal rupture of the bladder is more likely to occur in an inebriated person for two reasons; (1) The victim is off his guard, and consequently the abdominal musculature is not braced to receive the blow; (2) The bladder is likely to be full.

**Intraperitoneal Rupture of the Bladder.**—There is sudden agonizing pain in the hypogastrium, often accompanied by severe shock and perhaps syncope. However, in a few minutes the shock passes off, and the pain lessens—so much so that sometimes the patient resumes his occupation—but the abdomen soon distends because of paresis of intestinal coils bathed in urine (*Fig. 590*). Although there are exceptions, following the accident the patient has no desire to micturate. On examination a varying degree of abdominal distension is present. In spite of the fact that the patient has not passed urine since the accident, there is no dullness above the pubes corresponding to a distended bladder. Usually there is tenderness in the hypogastrium. Abdominal auscultation discloses an absence of, or greatly decreased, intestinal sounds. If the amount of urine in the peritoneal cavity is considerable, shifting dullness can be elicited. Rectal examination often reveals

a tender bulging in the rectovesical pouch. When the urine is sterile, symptoms and signs of peritonitis are delayed for several hours.

Should a patient with intraperitoneal rupture of the bladder not be seen until 24 hours after the accident, signs of diffuse peritonitis make the differential diagnosis from rupture of some other hollow viscus impossible, unless the patient has passed no urine since the accident.

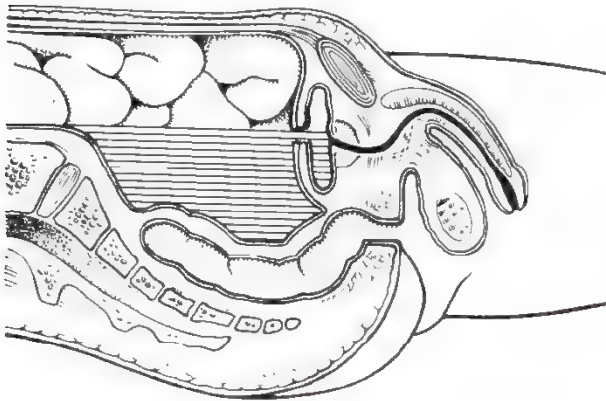


Fig. 590.—Intraperitoneal rupture of the bladder.

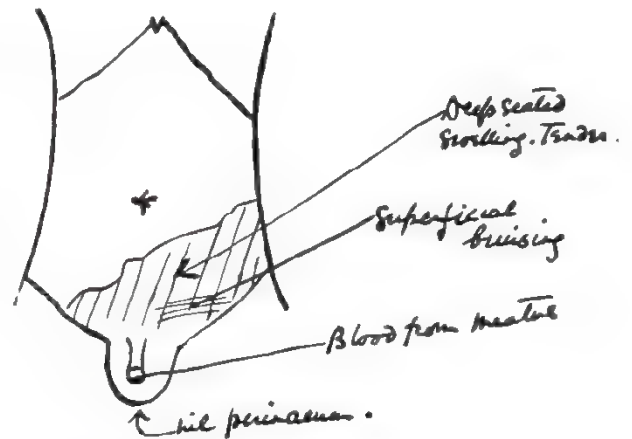


Fig. 591.—The physical signs recorded in a case of intrapelvic rupture of the urethra complicating a fractured pelvis. There was pain on compressing the iliac crests.

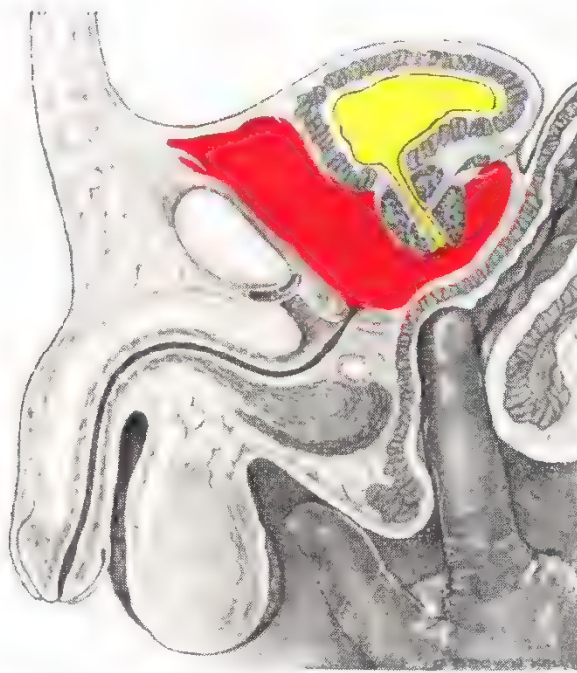


Fig. 592.—In intrapelvic rupture of the urethra the puboprostatic ligaments are torn and the prostate becomes displaced posteriorly. In its place the palpating finger encounters a soft mass (blood-clot).

**Extraperitoneal Rupture of the Bladder.**—The signs are identical with those of intrapelvic rupture of the urethra (*see below*).

**Intrapelvic Rupture of the Urethra.**—Usually signs of a fractured pelvis are evident and shock is pronounced, for, in addition to a fractured pelvis, about

half the patients will be found to have sustained other fractures; but this does not complete the list of major concomitant lesions. One must always be alert to the possibility of, and take precautions to eliminate, an additional intraperitoneal lesion. The patient has not passed urine since the accident, and the escape of blood via the meatus is a common occurrence. In intrapelvic rupture, as opposed to rupture of the bulbous urethra, there is no perineal swelling, but ecchymoses may be visible. On examining the abdomen tenderness above the pubes is always present. As a rule, a swelling can be felt in the hypogastrium. Extravasation into the pelvic fascia occurs early, and curiously, it usually proceeds more on one side than on the other (*Fig. 591*). Unless the rounded dome of the bladder can be palpated distinctly from the rest of the swelling (the extravasation), it is impossible to arrive at a differential diagnosis between extraperitoneal rupture of the bladder and intrapelvic rupture of the urethra by abdominal examination alone. Not infrequently, the key to the situation lies in a *rectal examination*. If, on introducing a finger into the rectum, the prostate cannot be felt, but in its position there is an indefinite doughy swelling (blood and urine) (*Fig. 592*), or if the prostate is felt, but is displaced upwards, and on exerting increased pressure upon it, it eludes the examining finger, then the diagnosis of a complete intrapelvic rupture of the urethra is certain (Vermooten's sign). Unfortunately this sign is not present regularly.

When, clinically, a ruptured urethra or bladder is suspected, further investigation, such as an attempt to pass a catheter, must be carried out in the operating theatre, where sterility can be ensured and operative treatment can follow immediately.

*Fig. 593.*—Rupture of the bulbous urethra after a fall astride on to a beam. The haematoma in the perineum is plainly visible. Blood is trickling out of the meatus. At operation the urethra was found completely divided.

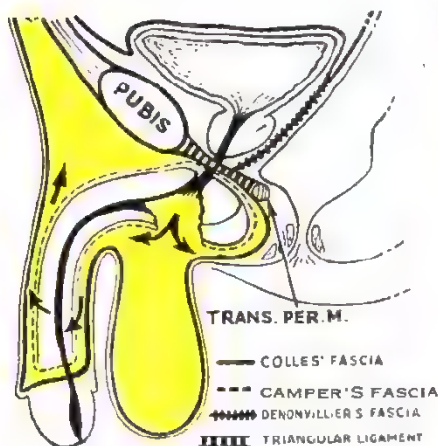


When incomplete intrapelvic rupture of the urethra has occurred a catheter may pass into the bladder. In cases of complete intrapelvic rupture of the urethra, the tip of the catheter can be felt per rectum protruding from the urethral tear as a longitudinal cord lying beneath the anal sphincter (Graham).

**Rupture of the Extrapelvic Urethra.**—This accident is almost always the result of a fall astride. *Fig. 593* shows a patient who had sustained a complete rupture of the bulbous urethra three hours before the photograph was taken. There is an obvious



haematoma in the perineum. The external urinary meatus was examined and showed a few drops of bright red blood escaping. The bladder was percussed, and it was found to be moderately distended, for, in order to prevent superficial extravasation of urine (*see below*), the patient, before being sent to hospital, was rightly warned *not even to try to pass urine*.



*Fig. 594.*—The fascial planes concerned in superficial extravasation of urine. The fusion of Colles' fascia with the anterior layer of the triangular ligament prevents extravasated urine from passing backwards beyond the middle perineal point.



*Fig. 595.*—Subcutaneous extravasation of urine.

## EXTRAVASATION OF URINE

### Superficial (Subcutaneous)

**Extravasation** will occur into the substance of the penis if Camper's fascia is intact. When, as is more usual, Camper's (syn. Buck's) fascia\* is torn or eroded, diffusion occurs superficial to this fascia, but beneath Colles' fascia, distending the perineum to the midperineal point, the scrotum, and the penis. Unrelieved, the extravasation or cellulitis that accompanies it passes up the abdominal wall beneath Scarpa's fascia, which is continuous with Colles' fascia (*Fig. 594*). In many cases superficial extravasation arises as a complication of periurethral abscess (*see Fig. 637*, p. 365), which in turn is the result of a urethral stricture. Traumatic rupture of the bulbous urethra accounts for some instances, while the unskilled passage of instruments such as sounds, catheters, or a cystoscope is the cause in others.

*The extravasated urine cannot pass:* (1) Behind the middle perineal point, because of the fusion of Colles' fascia (deep layer of the superficial perineal fascia) with the anterior layer of the triangular ligament (*Fig. 594*); (2) Into the thighs, for Scarpa's fascia (deep layer of the superficial fascia of the anterior abdominal wall) blends with the fascia lata just distal to the inguinal ligament; (3) Into the inguinal canal, because of the intercolumnar fibres and fascia of the external oblique.

\* This fascia is known as Camper's fascia in Europe, and as Buck's fascia in the U.S.A.

CHARLES P. DENONVILLIERS, 1808–72, *Surgeon, Paris*.

PETER CAMPER, 1722–1789, *Professor of Medicine, Anatomy, Surgery, and Botany, Groningen, Holland*.

GURDON BUCK, 1807–1877, *Surgeon, New York Hospital*.

ANTONIO SCARPA, 1747–1832, *Professor of Surgery, Modena, and Professor of Anatomy, Pavia, Italy*.

ABRAHAM COLLES, 1773–1843, *Professor of Anatomy and Surgery, Dublin*.



*It therefore must pass:* (1) Into the scrotum; (2) Into the subcutaneous tissues of the penis; (3) Up the abdominal wall in the subcutaneous planes (*Fig. 595*).



*Fig. 596.*—Obvious oedema of the prepuce with palpable scrotal oedema. The patient was admitted as a case of extravasation of urine. Examination of the perineum showed no periurethral abscess or induration of a stricture. This aroused suspicion. Examination of the ankles revealed pitting on pressure. The cause of the oedema was congestive cardiac failure (*see p. 10*).



*Fig. 597.*—Deep extravasation of urine following intrapelvic rupture of the urethra.

Superficial extravasation may be simulated very closely by oedema complicating a failing heart (*Fig. 596*).

**Deep Extravasation of Urine** takes place into planes of deep pelvic fascia (*Fig. 597*). It occurs in intrapelvic rupture of the urethra and extraperitoneal rupture or perforation of the bladder (*see p. 340*).

## CHAPTER XXIV

### CLINICAL EXAMINATION OF THE URINARY ORGANS

DIAGNOSIS of urinary disease is largely a matter for special investigation. With the advent of the cystoscope, the urethroscope, X-rays (including arteriography), and biochemistry, clinical methods are comparatively unimportant. Often the principal object of the preliminary clinical examination is to suggest the exact form that special investigations will take, and to exclude disease of other organs. Be that as it may, careful inspection of recently voided urine when a patient is first seen is often of inestimable value.

The clinician should develop a routine of examining the urinary organs, starting with the kidneys and extending systematically downwards to the external urinary meatus. Some prefer to conduct the examination in a reverse manner.

#### HAEMATURIA

When the bleeding proves transitory, sometimes, sad to relate, instead of a full urological investigation being arranged, the patient is seen wending his way homeward carrying a supply of antibiotics. It is fervently requested that the reader of this book will never permit his clinical conscience to subscribe to this trouble-saving course that may well seal his patient's doom.

Often, by the time the patient arrives for the consultation, the bleeding has ceased. Not infrequently the patient will bring with him a bottle of blood-stained urine. For a woman to collect such a specimen is more difficult. Pour the urine into a glass and observe if the specimen contains any sediment or clots. Whether the patient has brought a specimen or not, should it seem probable that the bleeding is still in progress, it is more valuable to obtain a fresh specimen, and with a male, watch him pass urine. Is the blood integrally mixed with the urine? Is it bright red? Is there more or is there less blood in the terminal portion of the specimen? Such are the data the clinician should collect.

If blood is mixed with the whole specimen of urine it is possible for the lesion to be situated in the bladder, but much more often it is in a kidney. On the other hand, if the bleeding occurs either at the beginning or at the end of micturition, the source of the haemorrhage is much more likely to be in the bladder, especially in the neck of the bladder, or in the prostate. Nevertheless, the elucidation of the cause of haematuria remains a problem in which cystoscopy combined with radiography have so minimized the importance of physical signs as to render the findings so obtained little better than a tentative hypothesis.

In the tropics haematuria often complicates *schistosomiasis*.

#### INSPECTION OF THE URINE OTHER THAN FOR HAEMATURIA

Time was when the colour, the clearness or cloudiness, and the quantity of urine passed in the twenty-four hours—all still supremely important—were the

only methods\* of examining the urine known to clinicians. The following physical observations remain of steadfast value.

**A Midstream Specimen of Urine** should be inspected before being dispatched for bacteriological examination. If there is a sediment, it may be due to phosphates or to pus—add a few drops of acetic acid to the specimen: if the sediment disappears, it is due to phosphates. A description of other chemical tests is beyond the scope of this work.

**Bile in the Urine.**—Bile-pigments give the urine a greenish-brown colour with a yellow or brown foam when the container is shaken. On standing, bile-stained urine may assume a greenish hue (oxidation of bilirubin into biliverdin).

**Porphyria.**—As a rule, the urine of patients suffering from porphyria is orange-coloured (which is often dismissed as 'concentrated'). On exposure for a few hours the top of the specimen (where it is exposed to the air) becomes amber-coloured (*Fig. 598*).



*Fig. 598.*—Colour of urine, after standing overnight, in porphyria.



*Fig. 599.*—Urine after ingestion of a patent medicine containing methylene blue.



*Fig. 600.*—'Beeturia'.

**Change of Colour due to Drugs.**—Cascara, senna, and rhubarb tend to render the urine brown. Salicylic acid and pyridine render it reddish-yellow. Sulphonal and trianol cause it to become pink. Methylene blue (a constituent of some patent medicines) in small amounts produces a greenish colour; in large amounts the colour is blue. The patient whose urine is shown in *Fig. 599* had lumbar pain, for which he took 'backache pills'. On passing green urine he came hurrying to hospital in an agitated state, believing that his kidneys were grossly diseased. Complete renal investigation showed no abnormality, and physiotherapy cured his lumbago.

**'Beeturia'.**—Clinical acumen is never superfluous. Even in such a seemingly laboratory matter as abnormal coloration of the urine it may come into its own, for example, when beetroot is in season. The shade of red given by urine containing blood certainly varies very greatly, but

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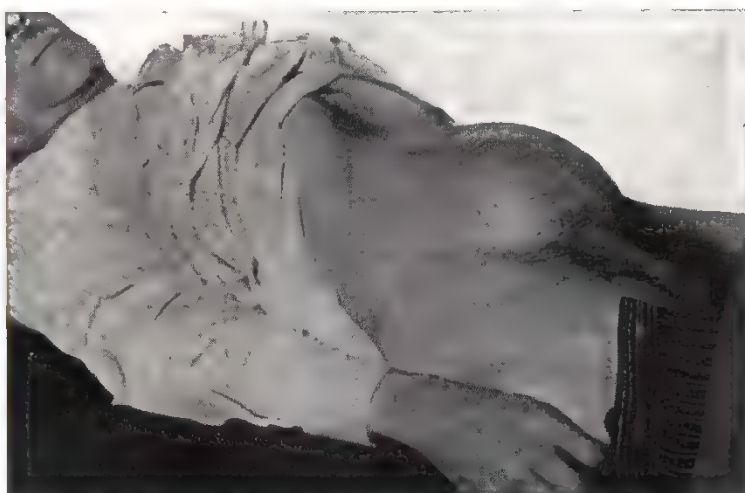
\* Thomas Willis first drew attention to the sweet taste of diabetic urine.

it never resembles the peculiar purplish hue of *betacyanuria* (the correct term) which is present in some 10 per cent of the populace (*Fig. 600*). Roche likened the colour to that of cherry brandy.

**Chyluria.**—The urine is milky-white from the fat globules of the chyle. Chyluria occurs as the result of obstruction to the thoracic duct or the cisterna chyli, gross dilatation of lymphatic vessels, and rupture of a distended lymphatic vessel into some part of the urinary tract. Obstruction of a main duct can occur from a neoplasm pressing upon it, or from tuberculous mesenteric lymphadenitis pressing upon the cisterna, but by far the most common cause is occlusion of lymphatic vessels by the *Wuchereria bancrofti*. Therefore inquire if the patient has resided in a tropical or subtropical zone, and look for evidence of filariasis by examining the scrotum or the labia majora (*Fig. 601*) for solid oedema.



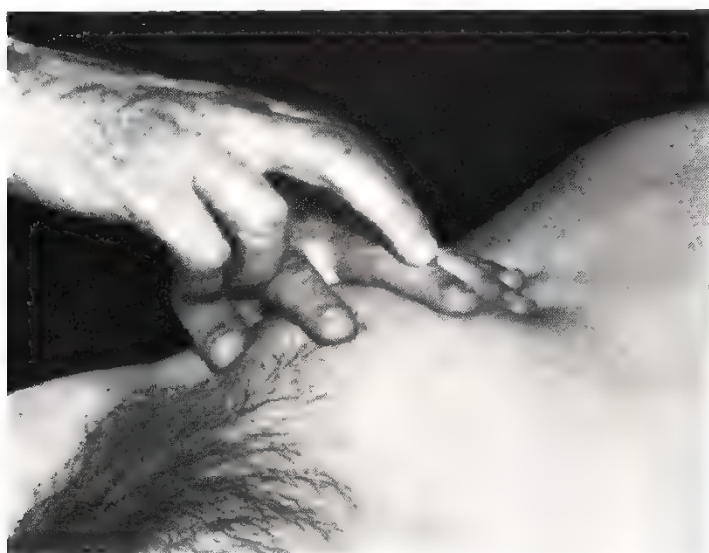
*Fig. 601.*—Solid oedema of the left labium majus (elephantiasis). As the patient had suffered from lymphogranuloma inguinale (note the scar) as well as filariasis, it is problematical which was the cause of the lymphatic obstruction.



*Fig. 602.*—Acute retention. Bladder extending to the umbilicus.

#### ACUTE RETENTION OF URINE

**Distension of the Bladder.**—The distended bladder can be seen in the subject illustrated in *Fig. 602* as a rounded swelling arising out of the pelvis. When the full bladder is either not full enough, or the abdominal wall is too well covered to permit the swelling thus produced to be seen, it can be felt. A distended bladder provides one of the few instances when percussion to determine the extent of an



*Fig. 603.*—Percussing the bladder.

area of dullness is absolutely reliable. This should be carried out from above downwards—that is, from the resonant area to the dull (*Fig. 603*).

**Cause of the Retention.**—*In the male* the meatus should be examined for atresia or a urethral discharge; the perineum observed for signs of periurethral abscess. Palpation along the course of the urethra, particularly in the neighbourhood of the penoscrotal junction, may reveal the induration of a stricture; rarely an impacted urethral calculus can be felt. The prostate should next be palpated by rectal examination (*see p. 367*). It should be recalled that benign prostatic enlargement is easily the commonest cause of retention of urine, and with a full bladder it may not be possible to appreciate the exact size of the prostate. On the other hand, if the retention is caused by carcinoma of the prostate (*see p. 368*), the typical hardness of the gland can be detected usually, even with a full bladder. In all cases where the cause is not evident the integrity of the central nervous system should be investigated. It is taught commonly that, for practical purposes, testing the knee-jerks and the reaction of the pupils suffices as a means of detecting organic disease of the central nervous system affecting the reflex arc of micturition. With the virtual disappearance of tabes dorsalis this is poor advice. Far better is it to test the ankle-jerks and the cutaneous sensation in the perineum—two simple measures that supply this essential information (Gibbon).

For practical clinical purposes recall Shakespeare's 'Seven Ages of Man' from *As You Like It*.

Jacques

All the world's a stage,  
And all the men and women merely players:  
They have their exits and their entrances:  
And one man in his time plays many parts,  
His acts being seven ages. At first the infant,  
Mewling and puking in the nurse's arms.  
And then the whining schoolboy, with his satchel,  
And shining morning face, creeping like snail  
Unwillingly to school. And then the lover,  
Sighing like furnace, with a woeful ballad  
Made to his mistress' eyebrow. Then a soldier,  
Full of strange oaths, and bearded like the pard,  
Jealous in honour, sudden and quick in quarrel,  
Seeking the bubble reputation  
Even in the cannon's mouth. And then the justice,  
In fair round belly with good capon lin'd,  
With eyes severe, and beard of formal cut,  
Full of wise saws and modern instances;  
And so he plays his part. The sixth age shifts  
Into the lean and slipper'd pantaloons,  
With spectacles on nose and pouch on side;  
His youthful hose well sav'd a world too wide  
For his shrunk shank; and his big manly voice,  
Turning again towards childish treble, pipes  
And whistles in his sound. Last scene of all,  
That ends this strange eventful history,  
Is second childishness, and mere oblivion—  
Sans teeth, sans eyes, sans taste, sans everything.

Apply these to the cause of acute retention of urine in the *male*:—

1. 'The infant, mewling and puking in the nurse's arms.' The cause of his retention is a posterior urethral valve.



2. 'The whining schoolboy, with his satchel' probably has an enlarged bladder neck (Marion's disease), but obturation by a stone should be suspected in areas where bladder calculi are still common.

3. 'The lover, sighing like furnace' is likely to be a case of retention following acute urethritis.

4. 'The soldier, full of strange oaths' almost certainly has a urethral stricture.

5. 'The justice, in fair round belly with good capon lin'd' is most probably a case of benign enlargement of the prostate.

6. When 'the sixth age shifts into the lean and slipper'd pantaloons', carcinoma of the prostate becomes relatively more frequent.

7. During the last age 'that ends this strange eventful history' carcinoma is even more likely although cases of benign enlargement still occur.

In the *female*, acute retention is comparatively uncommon, the three most usual causes being a retroverted gravid uterus, disseminated sclerosis, and hysteria. Therefore, when confronted with a female with acute retention of urine, palpate the uterus bimanually, and examine the central nervous system thoroughly.

**Postoperative Retention of Urine**—a common condition in both sexes—can be due to any of the causes listed but more often the patient cannot micturate lying down. Others have a 'bashful bladder'; they cannot pass urine when another person is in the immediate vicinity.

### SUPPRESSION OF URINE

The importance of the tongue as an indicator of efficient renal excretion has been discussed on p. 8.

**Prerenal Anuria** occurs from any cause that reduces the blood-pressure below that where filtration from the glomeruli ceases. A common cause is shock, and if after restoration of the blood-pressure to a more satisfactory level the patient does not pass urine, he should be catheterized to ascertain if urine is being excreted.

**Renal Anuria.**—The renal mechanism becomes ineffective from damage or destruction of renal epithelium. The causes are numerous and among those of particular surgical importance are incompatible blood transfusion, the crush syndrome, concealed uterine haemorrhage, and as a terminal event in congenital cystic kidneys. In this variety of anuria there is gradually increasing oliguria,\* and the oliguric phase lasts about ten to twelve days. Unless the condition is reversible and diuresis sets in during the second week, or is treated, clinical deterioration follows. Usually vomiting commences; abdominal distension is seldom absent. With prolonged oliguria somnolence may progress to stupor, mild delirium, or coma. Convulsions in oliguria nearly always signify excessive administration of water and sodium.

**Postrenal Anuria.**—The most common cause is blockage by a calculus of both ureters or the ureter of a sole functioning kidney (*calculous anuria*). Another cause is accidental ligation of both ureters during hysterectomy, or occlusion by a carcinoma of the cervix uteri. As a rule the anuria, which is rarely complete, commences suddenly during an attack of ureteric colic, and for the first five or six days the patient often feels comparatively well. However, unrelieved, the tongue becomes coated and the patient constipated, and eventually drowsy. Dryness of the tongue,

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\* Oliguria is an excretion of less than 300 ml. of urine in 24 hours.

meteorism, vomiting, and coma usher in the end, death occurring after about eight or ten days. In the last stages the temperature is often subnormal, and muscular twitchings are common. On abdominal palpation, provided overlying rigidity permits, one kidney is found to be enlarged and tender, and that kidney is the last to be obstructed. The bladder is empty; the urine is exceedingly scanty and probably blood-stained.

### CLINICAL EXAMINATION OF THE KIDNEYS

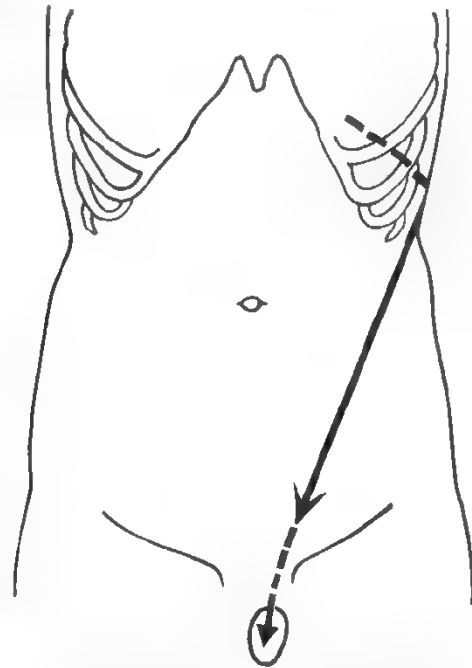
In order to be precise and accurate, it is best to discard the term 'renal colic' and speak of 'renal pain' and 'ureteric colic'.

**Renal Pain** is usually a dull ache situated mainly in the costovertebral angle, but also in the upper and outer quadrant of the abdomen. Often the patient indicates the site of this pain in the manner shown in *Fig. 604* (Pelouze). Renal pain is not strictly lumbar.

### RENAL PAIN AND URETERIC COLIC



*Fig. 604.*—A usual position of the hand of a patient who is showing where he experiences renal pain.



*Fig. 605.*—The pointing test in ureteric colic. The patient will map out the direction of the pain as passing from the loin to the groin.

**Ureteric Colic** is nearly always characteristic—the pain passes from the loin to the groin, and in the male frequently this radiation is prolonged to the testis, which becomes retracted. The patient can often map the course accurately (*Fig. 605*).

During, or soon after, an attack the pulse and temperature are normal. The abdomen moves on respiration. Palpation will reveal in the corresponding loin and iliac fossa some tenderness and guarding, but no true rigidity. In severe cases there may be hyperaesthesia. In the highly important differentiation of ureteric colic from appendicitis and intestinal colic, the rebound test (*see p. 296*) is of signal value *between* the attacks of colic. In ureteric colic the discomfort of deep palpation

is relieved when the examining hand is released. In appendicitis deep palpation causes fairly severe pain which is *accentuated* on releasing the hand.

This leaves intestinal colic to be differentiated from ureteric colic. The unilateral distribution of the pain in ureteric colic and the frequent deep tenderness along the line of the ureter (*see* p. 355) or over the kidney (*see* p. 351) will more often than not soon establish the colic as ureteric. In a few cases meteorism and ballooning of the rectum (*see* p. 286) lead to confusion. However, in ureteric colic the patient continues to pass flatus. If there is real doubt a radiograph of the abdomen should resolve it (calculus or fluid levels seen).

**The Renorenal Reflex.**—Occasionally pain associated with a lesion of one kidney is referred to the contralateral (normal) side (*Fig. 606*). Nevertheless, not every example of a seeming renorenal reflex is genuine. When one kidney is undergoing gradual destruction, its fellow is usually



*Fig. 606.*—This patient complained of recurrent attacks of pain in the position she indicates. The pyelogram shows a *right* double ureter with one of these ureters stenosed. The *left*-sided pain was relieved by operation on the *right* side.



*Fig. 607.*—Bimanual palpation of the kidney. Note that the posterior hand presses upward while the fingers of the anterior hand are directed cephalad and downward, and then slid in the reverse direction.

undergoing compensatory hypertrophy, and during this process it is liable to be the seat of attacks of pain.

**Recurrent Calculi.**—When there is a history of recurrent calculi palpate the thyroid gland for the possible presence of a parathyroid tumour, although for such a tumour to be large enough to be felt is most exceptional. Hyperparathyroidism, which 'causes the patient to pass his skeleton in his urine', results in a great increase in the elimination of calcium in the urine. Repeated estimation of the serum calcium, and, in late cases, radiographs to display bone decalcification, are required to make the diagnosis. This condition as a cause of urinary calculi is much less common than imperfect drainage of the renal pelvis or incomplete emptying of the bladder plus urinary infection.



Fig. 608.—Another method of palpating the kidney.



Fig. 609. Examining the kidney with the patient on the sound side. A useful method of examining and determining the nature of a lump that *may* be the kidney.

**Palpation of the Kidneys.**—The patient should lie on his back. The value of the examination is enhanced by placing a pillow beneath the knees, and often it is advisable to have the patient rolled slightly towards the side that is being examined.

There are several variations in technique. Probably the best is the bimanual method, which is illustrated in Fig. 607. After the hands have been adjusted nicely in position, and the maximum amount of relaxation of the patient's musculature has been ensured, he is asked to take a deep breath. The pulps of the fingers of the two hands are approximated as *expiration* is in progress. The second method is shown in Fig. 608. It is possible to endeavour to palpate both kidneys at one and the same time by this method, which is of service only in thin subjects and children. In cases of difficulty, it is valuable to examine the kidney with the patient lying upon the sound side (Fig. 609).

In a thin adult with poorly developed abdominal musculature the lower pole of the right kidney sometimes is palpable as a firm, smooth, somewhat rounded structure that descends with respiration. The normal left kidney is impalpable unless it is ptosed, which is unusual.

**The Renal Angle Test (Murphy's 'Kidney Punch').**—The patient sits up and folds his arms in front of him. The thumb is then placed under the 12th rib, and short, jabbing movements are made (Fig. 610). At first the movements are very gentle, but if pain is not experienced their strength is increased. This sign is of great value in determining deep-seated tenderness.

A valuable modification is to place the fingers of the opposite hand beneath the anterior costal margin and squeeze between the fingers in front and the thumb behind. Muscular pain is located directly beneath the thumb posteriorly; renal pain is located farther forward (Higham).

**A Renal Swelling.**—An enlarged kidney, from any cause, possesses these characteristics: (1) It lies in the loin, or can be moved into the loin; (2) Usually it maintains its original reniform shape; (3) It moves on respiration; (4) There is a band of colonic resonance anteriorly; (5) It is dull posteriorly.



*Fig. 610.*—The renal angle test (Murphy's 'kidney punch'). The thumb is placed under the 12th rib and to the lateral side of the sacrospinalis muscle, and sharp jabbing movements are made.

This classic picture will seldom be seen in its entirety, e.g., it is frequently impossible to demonstrate the band of colonic resonance.

Neoplasms of the kidney tend to enlarge anteriorly while large abscesses and hydronephroses sometimes produce considerable posterior projection.

**Differential Diagnosis between an Enlarged Left Kidney and an Enlarged Spleen.**

—This not unusual error can be obviated by the following means:—

1. If a sharp anterior border and/or a notch is felt, it is the spleen.
2. Unless it is extremely adherent to surrounding structures, which is unusual, an enlarged kidney gives the sign of ballottement (*see p. 13*).
3. The spleen enlarges inferiorly and medially, i.e., towards the right iliac fossa. Usually the kidney enlarges medially and posteriorly.
4. If dullness of the palpable swelling is continuous with the normal splenic dullness, it is the spleen.

In doubtful cases radiographic demonstration of the kidney is necessary.

**Congenital Cystic Kidneys.**—When both kidneys are much enlarged and *irregular*, congenital cystic kidneys should be thought of, particularly if the symptoms are few. Haematuria due to spontaneous rupture of one or more of the cysts, pain due to intracystic tension or to the supervention of infection or calculus formation, or symptoms of renal insufficiency eventually cause the patient to seek



advice. Infrequently the condition is mainly unilateral, when the diagnosis from a neoplasm becomes impossible without radiological investigation.

**Renal Ectopia as a Cause of an Abdominal Lump.**—A misplaced kidney can give rise to an abdominal swelling, and almost always there is considerable perplexity concerning its nature. Firstly, there is crossed ectopia, which results in both kidneys lying fused one above the other. The renal mass is palpable, and sometimes it is a little tender. Next there is the more common low position of a kidney with a short ureter. Such a kidney, which sometimes is the only kidney, lies in the iliac fossa or in the pelvis. In either of these situations it gives rise to a lump, and because a misplaced kidney is frequently the seat of ascending infection, the lump to which it gives rise is acutely tender and consequently usually is mistaken for an appendix abscess, diverticulitis, or a twisted ovarian cyst.

**The Association of Malformation of the Ears and Congenital Renal Abnormalities.**—Malformed ears, particularly if asymmetrical, are quite commonly associated with congenital malformations of the urinary tract such as double ureter, hydronephrosis, and horseshoe kidney. The deformity of the pinna is a bat-ear or a crumpled pinna somewhat like that of the Collins-Franceschetti syndrome (*see Fig. 160, p. 81*).

### NEOPLASMS OF THE KIDNEY

**a. Nephroblastoma** (Wilms's Tumour) ranks second only to retroperitoneal neuroblastoma (of the adrenal gland) as the most common malignant tumour of childhood. In two-thirds of the cases there is a swelling (*Fig. 611*) discovered, as a rule, by the mother when bathing or dressing the child. In one-third painless haematuria is the presenting sign. In a few, the first symptoms are those of metastases in the lungs, although this is much less frequent than in the case of adrenal neuroblastoma.

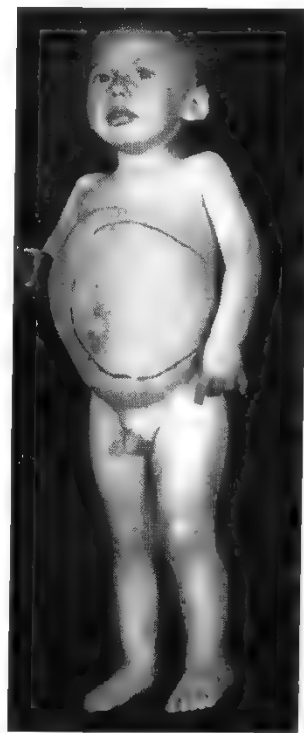
**b. Adenocarcinoma** (Grawitz's Tumour) is the most common variety of malignant disease of the kidney in adult life. By far the most frequent sign is painless, profuse, intermittent haematuria. Investigation by excretory and retrograde pyelography should be made before a renal mass becomes palpable.

Less common ways of presentation are symptoms arising from a metastatic deposit, the primary neoplasm being quite silent. The commonest situation for such a deposit is a long bone, and it sometimes requires a biopsy to determine the nature of the neoplasm. A spontaneous fracture from this cause, or a persistent cough or haemoptysis from metastases in the lungs, also occur. Another, but more unusual, symptom is persistent dull pain without haematuria. The development of an acute varicocele is a rare first manifestation (*see p. 381*) as is obstruction to the inferior vena cava (*see p. 18*). Lastly, there is a type in which intermittent pyrexia is the only sign, there being no associated infection.

### PERINEPHRIC ABSCESS

The diagnosis of perinephric abscess rests almost entirely on the clinical examination, and it is necessary to bear the condition constantly in mind when one is investigating pyrexia of unknown origin. Too often the diagnosis is delayed unduly because the patient's *back* has never been examined (*Fig. 612*).

**Inspection.**—First examine the patient in the sitting posture. The area immediately beneath the last rib and lateral to the sacrospinalis muscle is scrutinized; it is compared with the opposite side. In this situation the merest fullness is often



*Fig. 611.*—Wilms's tumour (nephroblastoma) is the second most frequent cause of abdominal enlargement due to a solid unilateral intra-abdominal tumour in childhood.

MAX WILMS, 1867–1918, *Professor of Surgery, Heidelberg.*  
PAUL A. GRAWITZ, 1850–1932, *Professor of Pathology, Greifswald, Germany*

the indication of a large collection of deep-seated pus. Scoliosis of the lumbar spine with concavity towards the affected side is almost a constant sign, even in early cases.

When an abscess is related to the lower pole of the kidney, a swelling in the renal area may be present early but when, as is more usual, it is related to the



Fig. 612.—A large perinephric abscess. Seldom is a swelling like this apparent. It is to direct attention as to where to look for the faintest semblance of a fullness that this illustration is included.



Fig. 613.—In cases of perinephritis and perinephric abscess, bending the trunk *away* from the side of a lesion is more likely to cause pain than the reverse manœuvre.



Fig. 614.—Palpating a stone in the ureter, via the vagina. A thickened tuberculous ureter also can be detected by this procedure.

upper pole or the posterior surface of the kidney, the mass is imperceptible, even in well-advanced cases, because the rigid lower part of the costal cage renders it inaccessible. Bending the trunk *away* from the side of the abscess may produce pain (Fig. 613), whereas the patient can bend his body towards the lesion without much discomfort (Foulds).

**Palpation.**—The renal angle test (*see* p. 351) is now applied. In cases where diagnosis is still in doubt, pillows should be removed, and the patient instructed to lie prone and quite straight. On the sound side the fingers can be dipped deeply towards the kidney; on the affected side, muscular resistance prevents this manœuvre.

### THE URETER

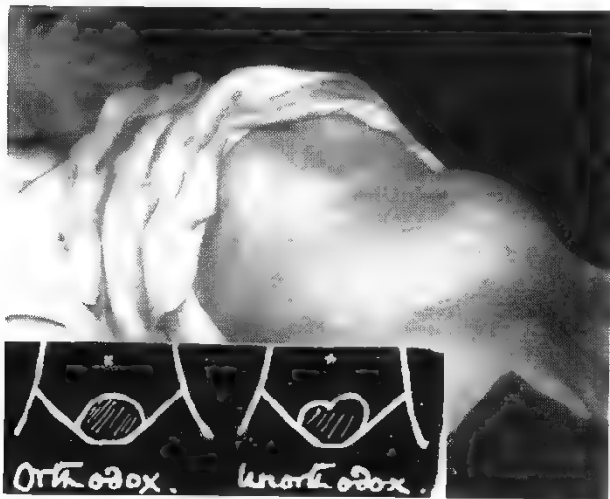
**Ureteric Calculus.**—Only if a scar in the right iliac fossa proclaims that the appendix has already been removed can the clinician be absolutely certain that acute pain in that situation is not due to acute appendicitis.

For the differentiation of ureteric colic from acute appendicitis and intestinal colic *see* p. 349.

Plain radiographs often show an opacity which *could* be a stone in a ureter, but pyelography (either intravenous or retrograde) is frequently necessary to be absolutely certain. Without this investigation the diagnosis of ureteric calculus from non-acute abdominal conditions is difficult, and sometimes impossible.

**Trans-abdominal Palpation of the Ureter.**—The general application of this measure is unrewarding, but it is of service in detecting a grossly thickened (tuberculous) ureter in a thin patient, and also for eliciting ureteric tenderness. The technique is that of deep abdominal palpation (*see* p. 230 and *Fig. 430*), but in this instance stand on the same side as the ureter to be examined and place the hands flat upon the abdomen over the line of the ureter.

**Vaginal Palpation of the Ureter.**—The index finger is passed into the vagina and into the lateral fornix upwards and outwards until its pulp reaches the highest point it can touch; it is then carried downwards and inwards. By using this method (Kelly) a large ureteric calculus just above the bladder can be felt bimanually sometimes (*Fig. 614*); at other times the thickened ureter of tuberculosis or the tender ureter of a ureteritis can be discerned.



*Fig. 615.*—Retention with overflow. Note the contour of the dome of the over-full bladder well to the left of the midline in this instance. The patient made no complaint of pain or difficulty of micturition.



*Fig. 616.*—Assessing the size and extent of a carcinoma of the bladder, under general anaesthesia. The bladder must be completely empty. (After Jewett.)

### THE BLADDER

Once again the opportunity is taken here to warn the reader never to express an opinion on a swelling rising out of the pelvis until the bladder has been emptied by a catheter (*see* p. 232).

**Acute Retention of Urine** (*see* p. 346).

**Retention with Overflow.**—The patient makes but little or no complaint of pain or dysuria but dribbles urine constantly. The swelling arising out of the pelvis is wont to be mistaken for some other condition. This error is more frequent when the contour of the bladder is unorthodox (*Fig. 615*, inset).

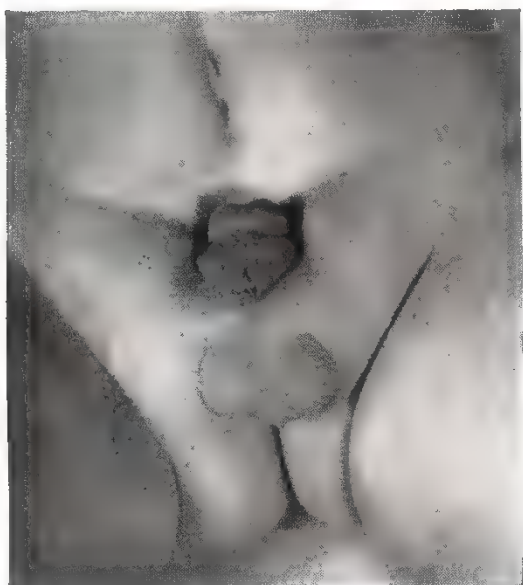
An empty bladder cannot be felt: it must extend above the pubic symphysis before it can be palpated. In infancy and childhood the bladder contains relatively little urine before it becomes palpable. That the swelling in question *is* the bladder is suggested by the fact that steady pressure upon it will evoke a desire to micturate or increase the dribbling in retention with overflow.

**Diverticulum of the Bladder.**—Occasionally a large vesical diverticulum surrounded by inflammatory thickening can be recognized by deep palpation above the pubes or per rectum.

**Carcinoma of the Bladder.**—It is only when a neoplasm of the bladder is very advanced that it becomes palpable by ordinary methods; on the other hand, bi-manual palpation (*Fig. 616*), especially when performed under the relaxation afforded by anaesthesia, is of diagnostic assistance in assessing the extent of a vesical neoplasm, the presence of which has been ascertained by cystoscopy.

**Palpation of the Bladder per Rectum.**—So unusual is it for affections of the bladder, other than retention of urine and carcinoma, to provide any physical signs, that it is sometimes forgotten that a large stone in the bladder can be felt per rectum. In cases of prostatic enlargement it is useful to examine the base of the bladder per rectum *soon after the patient has passed urine*. By careful palpation a rough idea will be obtained of the amount of residual urine present.

**Ectopia Vesicae.**—In this condition the bladder mucosa (*Fig. 617*), with the ureteric orifices discharging urine, can be seen.



*Fig. 617.*—Ectopia vesicae.



*Fig. 618.*—Urethral caruncle: the so-called 'raspberry' tumour.

### THE FEMALE URETHRA

For the examination of the female urethra the dorsal position, with the thighs abducted, is desirable; indeed, it is almost essential. When the labia are separated preparatory to vaginal examination (*see p. 291*) the eyes of the trained observer are directed first to the urethral orifice.

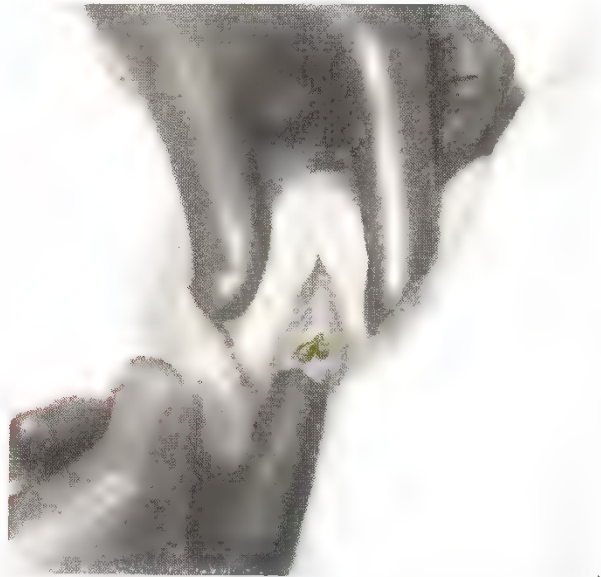
**Urethral Caruncle** is at once apparent as a small, pouting, granulomatous mass about the size of a pea (*Fig. 618*). With a probe, it can be determined that the protrusion arises from a broad pedicle attached to the posterior urethral wall. The mass is exquisitely tender and bleeds readily.



**Carcinoma of the Urethra**, although rare, occurs twice as frequently in the female as in the male. A visible protrusion that bleeds easily is the commonest manifestation. The final differential diagnosis between this and the above condition is histological, but a 'caruncle' of larger size than usual (*Fig. 619*), and one of any dimensions with induration, should be diagnosed provisionally as carcinoma. Palpate the inguinal lymph-nodes, enlargement of any of which, in the absence of infection, makes the diagnosis of carcinoma almost certain.



*Fig. 619.*—Papilliferous carcinoma of the urethra.



*Fig. 620.*—Palpating the urethra through the vagina. In relevant cases pus can be milked from the urethra and expressed from Skene's tubules, which are shown exuding pus in this case.

**Prolapse of the Urethra.**—Prolapse of the posterior urethral margin occurs in many women past the menopause, and becomes apparent when the patient is asked to strain. When the patient suffers from urethrotrigonitis, which causes straining at micturition, the prolapse becomes progressively larger. With partial prolapse the orifice is eccentric; when complete it is central.

**Urethritis.**—The urethra can be palpated through the anterior vaginal wall; the meatus should first be swabbed. In cases of gonorrhoea sometimes pus can be milked from the urethra in this way (*Fig. 620*). In urethritis from any cause, gentle pressure of the anterior urethra against the symphysis causes pain. This sign of urethral tenderness is most reliable, and explains the fact that the chief complaint of many women with this condition is dyspareunia.

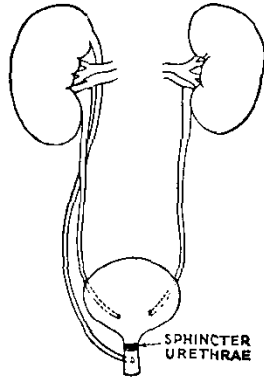
**Stress Incontinence.**—The patient, usually multiparous, cannot control the escape of urine while coughing, laughing, or when the opportunity to empty a full bladder is not available immediately. That stress incontinence is present can be demonstrated by examining the urethral orifice while the patient has a (at least moderately) full bladder and requesting her to cough. When the urethral sphincter is not fully competent urine escapes at each expulsive effort.

Pass a finger into the vagina and seek the pubococcygeus muscle, the main controlling sphincter of the urethra. When the development, integrity, and tone of this muscle are normal it can be felt as a broad muscular band 1 cm. proximal to the introitus, i.e., just proximal to the pubic rami. Ask the patient to contract her



muscles 'as though trying to hold her water'. In stress incontinence the contractions of pubococcygeus are weak and the vagina beyond is commodious.

**Intractable Urinary Incontinence.**—Apart from a spina bifida, any girl or woman who has dribbled for as long as she can remember, despite the fact that she has a normal desire to void, and indeed does urinate, has an ectopic ureteric orifice (*Fig. 621*). The demonstration of this orifice is often extremely difficult because it is guarded by a valve. Provided the renal tissue



*Fig. 621.* —Showing how an accessory ureter opening in an ectopic position below the urethral sphincter can cause intractable urinary incontinence in a female.

drained by the ectopic ureter is sufficiently active to concentrate the dye, the diagnosis can be established by giving an intravenous injection of indigocarmine, and placing one swab in the vestibule and another in the vagina. The swab coloured blue signifies the position of the ectopic ureteric orifice.

**Urethral Diverticulum** (urethrocele) is more common in women than in men. As the diverticulum enlarges in size, inability to pass all the urine at one time, or dribbling after micturition, occurs. On digital examination the swelling can be felt on the anterior vaginal wall in the line of the urethra, and when it is compressed, urine, usually obviously purulent, is expressed.

## CHAPTER XXV

## THE MALE GENERATIVE ORGANS: VENEREAL DISEASE

WHILE the patient is getting ready for the examination behind a screen or in a side-room (he should at least strip from the waist down), he is requested to micturate into a glass. If, however, there is a history of a urethral discharge, he should be asked to micturate after the meatus has been inspected (*see* p. 360).

It is convenient to have the patient recumbent, so that in due course the groins, the perineum, and the abdomen can be examined. Following this, a rectal examination is undertaken. Finally, for a thorough examination of the testes, the patient must rise and stand erect (*see* p. 372).

## EXAMINATION OF THE PENIS

The chief of a number of abnormalities and diseases that are encountered will now be discussed briefly.

**Phimosis.**—This term has come to be applied loosely; it is most necessary to make a distinction between *redundancy of the prepuce* and true *phimosis*\*. Only if the patient's foreskin cannot be retracted because its orifice is stenosed, is he suffering from phimosis. It is common knowledge that the prepuce normally may be adherent to the glans penis during the first three years of life, and there is no need to separate the adhesions (Gairdner), for this is not true phimosis. Phimosis can also be acquired, usually in the elderly, as the result of cicatricial contraction following long-standing chronic balanoposthitis†.

When the prepuce is present ask the adult patient to retract it; that this is a wise preliminary step to an examination of the urogenital organs is shown by a perusal of the legends of *Figs. 622 and 623*. When the foreskin is not adherent to the glans the situation shown in *Fig. 624* becomes a possibility.

Because phimosis prevents any prospect of the glans being cleansed, it leads to retention of smegma and chronic balanoposthitis. For this reason it may well be the cause of chronic irritation that leads to carcinoma of the penis (*see* p. 363).

**Paraphimosis.**—It is truly remarkable that paraphimosis, especially when it has been present for several days, is overlooked so often. The reason is that the clinician mistakenly assumes that the uncircumcised patient with his exposed glans imprisoned outside a tight prepuce is in fact circumcised. Should the possibility cross one's mind, obviously the first thing to do is to ask the patient if he has been circumcised. It is amazing how often the reply is inconclusive; some seemingly intelligent men do not appear to know. With paraphimosis, if the skin of the penis is drawn towards the pubis, and the area behind the corona scrutinized, oedema

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\* *Phimosis*. Greek, *φίμωσις* = a stopping-up; a closure.

† *Balanitis*. Greek, *βάλλανος* = an acorn, the glans penis + *ιτις* = inflammation.

*Posthitis*. Greek, *πόσθη* = prepuce + *ιτις* = inflammation.

limited abruptly by a constricting band (*Fig. 625*) can be seen. This leaves no doubt as to the diagnosis.

Reverting to the general examination of the penis and to the original request for the patient to retract his foreskin:—



*Fig. 622.*—Case I. The patient is a man of 71, complaining of great difficulty in micturition. In this illustration the patient's redundant foreskin, which shows nothing unusual, is seen.



*Fig. 623.*—When an attempt is made to retract the prepuce it is evident at once that the patient has a most extreme phimosis—the orifice in his foreskin is no larger than that which could be made by a large pin. Circumcision cured the condition completely.



*Fig. 624.*—Case II. Chronic retention of urine caused by extreme ballooning of the foreskin, due to a pinhole opening therein (inset), resulting in a 'second bladder'.

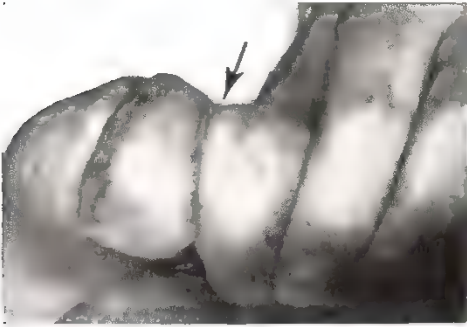
**The Prepuce can be retracted.**—When a discharge is present, observe whether it comes from the interior of the preputial sac or whether it issues from the urethra. A subpreputial discharge, which frequently is confused with a urethral discharge, may be due to one of several causes, notably chancre, chancroid, balanoposthitis, or a carcinoma.

#### **Examination of the External Urinary Meatus.—**

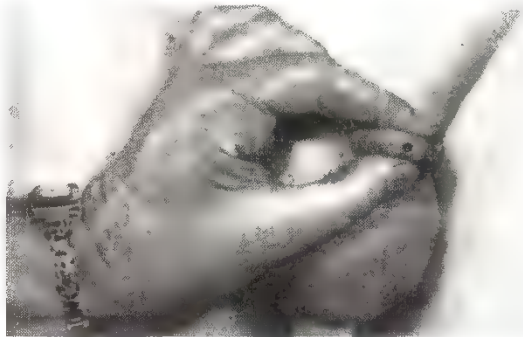
*Pinhole meatus* is often overlooked, both in infants and those of more mature years. *Fig. 626* shows the method of testing whether the orifice is adequate.

*Infection of Morgagni's Follicles.*—These are a pair of follicles that open laterally just behind the lips of the urethra. Often they become infected in urethritis, and then their mouths are more obvious, and perhaps pus can be seen exuding therefrom (*Fig. 627*). Frequently they are overlooked for want of inspecting the meatus in the manner shown in *Fig. 626*.

*Infection of Tyson's Glands.*—These are bilateral sebaceous glands situated on either side of the fraenum and communicating, not with the urethra, but with the preputial sac. Their function is the production of smegma. When a Tyson's gland becomes infected (usually in gonorrhoea) it gives rise to a firm, tender swelling on the under-surface of the glans penis, just lateral to the fraenum. Sometimes the inflammation is bilateral.



*Fig. 625.*—Paraphimosis. The constricting band is often inconspicuous until the skin of the shaft of the penis has been put on the stretch.



*Fig. 626.*—Is the meatus adequate? By compressing the tip of the penis between a finger and thumb anteroposteriorly the lips of the meatus are opened, and it can be observed at once whether the orifice is stenosed.



*Fig. 627.*—Pus exuding from the right follicle of Morgagni.



*Fig. 628.*—Meatal ulcer with scab formation. The scab occludes the external urinary meatus.

*Meatal Ulcer* of infant boys is a clinical entity that is often imperfectly understood. It is rarely found in the uncircumcised. It is common after circumcision (a good argument against indiscriminate use of this operation), although eighteen months may elapse between the operation and the onset of symptoms. It probably is due in the first place to abrasion of the delicate unprotected mucosa by napkins, and is characterized by alternating open ulceration and scabbing of the meatus (*Fig. 628*), giving rise respectively to a drop of bright red blood on the diaper and attacks of screaming from temporary retention of urine. Secondary infection of the urine follows. More often than not, on close examination the anteroposterior diameter of the external urinary meatus is shorter than normal. In some cases there is an unmistakable pinhole meatus. Untreated, cicatricial contracture of the meatus—in other words, an acquired pinhole meatus—is liable to ensue.

**Congenital Abnormalities.—**

**Hypospadias** is the most common congenital malformation of the urethra; it occurs once in every 350 males. The external urinary meatus is situated at some point upon the under-surface of the penis, or in the perineum. (a) *Glandular*, the opening being situated in the glans, but below the normal location, generally at a point where the fraenum (which is absent) is normally attached. A blind depression marks the normal site of the meatus. This is by far the most common variety. (b) *Penile*: The opening is situated at some point on the under-surface of the penis between the glans and the penoscrotal junction (*Fig. 629*). (c) *Perineal*: This is least common, the opening being situated about 3 cm. in front of the anus. The scrotum is cleft and the testes, if descended, usually are small. In all varieties the penis curves downwards (*chordee*★) but this is minimal in type (a).



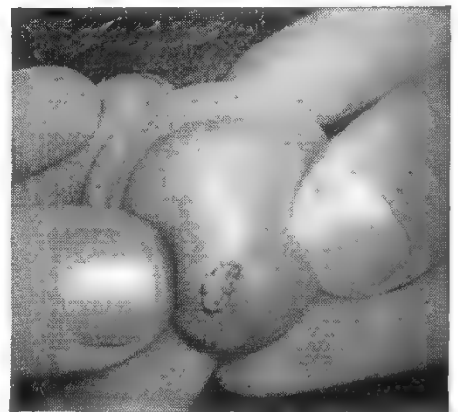
*Fig. 629.*—Penile hypospadias. In this case the urinary meatus is situated half-way down the penis.



*Fig. 630.*—Male pseudo-hermaphrodite.



*Fig. 631.*—Epispadias.



*Fig. 632.*—Urethral papilloma protruding from the external urinary meatus.

A **Male Pseudo-hermaphrodite** is, in effect, a person with intra-abdominal testes, perineal hypospadias, and a cleft scrotum, the latter being mistaken for labia majora. The patient illustrated in *Fig. 630* was brought up as a girl until the age of 20, when the urge to become a male became manifest. In cases of doubt have a histological examination performed on epithelial cells obtained by scraping the buccal mucosa to determine whether the patient is, in fact, male or female.

★ *Chordee*. French, *cordée* = a cord.



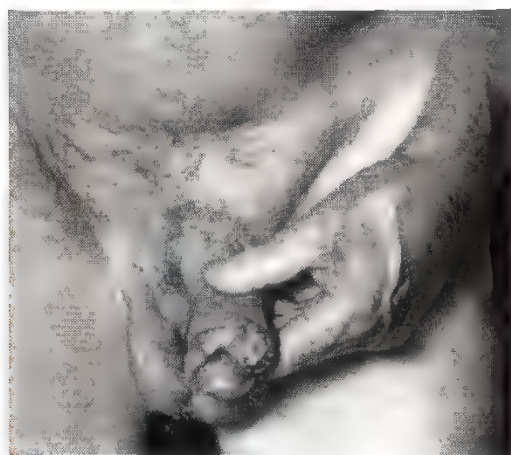
**Epispadias** is very uncommon. The urethra lies above the corpora cavernosa and opens at some point on the dorsal surface of the penis (*Fig. 631*). In epispadias totalis the malformation is accompanied by incontinence of urine, and frequently is associated with ectopia vesicae (*see p. 356*). The penis curves upwards.

**Urethral Papilloma.**—From time to time a solitary papilloma springs from the fossa navicularis and protrudes from the external urinary meatus (*Fig. 632*). The typical symptom of papilloma of the urethra is slight haematuria immediately preceding micturition.

**Venereal Warts (Papillomata Acuminata\*)** are the most common benign neoplasms of the penis. They occur in both the uncircumcised and the circumcised, and are most luxuriant in the coronal sulcus (*Fig. 633*). As a rule, these papillomata are moist, and are attended by an evil-smelling serous discharge.



*Fig. 633.*—Papillomata acuminata.



*Fig. 634.*—Carcinoma of the penis. The growth, now ulcerative and indurated, probably commenced as a papilliferous neoplasm.

**Carcinoma of the Penis.**—The incidence of carcinoma of the penis is particularly high among Hindus (who do not practise circumcision), Chinese, and the inhabitants of Malaya, but it is by no means uncommon in those of European descent. In addition to chronic balanitis, leucoplakia of the glans (precisely similar to the well-known condition on the tongue) is a precursor. It is almost unknown in Jews who practise circumcision shortly after birth and relatively rare in Moslems who undergo the operation at puberty.

Other rarer, but definitely precarcinomatous, conditions are Paget's disease of the penis (similar to Paget's disease of the nipple, *see p. 168*) and Queyrat's erythroplasia. The latter is a bright red, shiny lesion, velvety to touch, accompanied by a copious serous exudate, usually occurring in a single area and situated in the coronal sulcus: there is no induration.

When the prepuce is retractable the patient may present with a carcinoma of the penis at a fairly early stage. There are two forms of the disease, papilliferous and ulcerative (*Fig. 634*), and each is diagnosed by the induration of the base of the lesion. Should induration be doubtful, biopsy is essential. More often the foreskin cannot be retracted, and the neoplasm remains symptomless until it produces an evil-smelling discharge, which later becomes blood-stained. In

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\* *Acuminatus*. Latin = sharp-pointed.

such cases, unless there is considerable oedema produced by the concomitant balanoposthitis, the neoplasm can be felt through the foreskin. The reader is exhorted not to jump to a conclusion that the cause of the discharge is a venereal disease, even though the patient be comparatively young (carcinoma of the penis is not unusual below the age of 40 years, particularly in coloured races). If in doubt the proper course is to slit the foreskin on the dorsum under anaesthesia, and thus expose what lies beneath.

**Palpation of the Inguinal Lymph-nodes.**—In every case of an inflammatory, or a suspected neoplastic, lesion of the penis the inguinal lymph-nodes must be palpated. Often they are found to be enlarged, but unless the nodes are stony hard, reserve judgement as to the cause of the enlargement, for in 50 per cent of cases of carcinoma of the penis the enlargement of the nodes is inflammatory, and not due to metastases.

**Sebaceous Cysts** in the skin of the shaft of the penis are uncommon. When one becomes subacutely infected, it offers a diagnostic problem. Before rupture, it can simulate a bubonulus.\* After indolent rupture, like Cock's peculiar tumour (*see* p. 52), it can resemble a carcinoma.

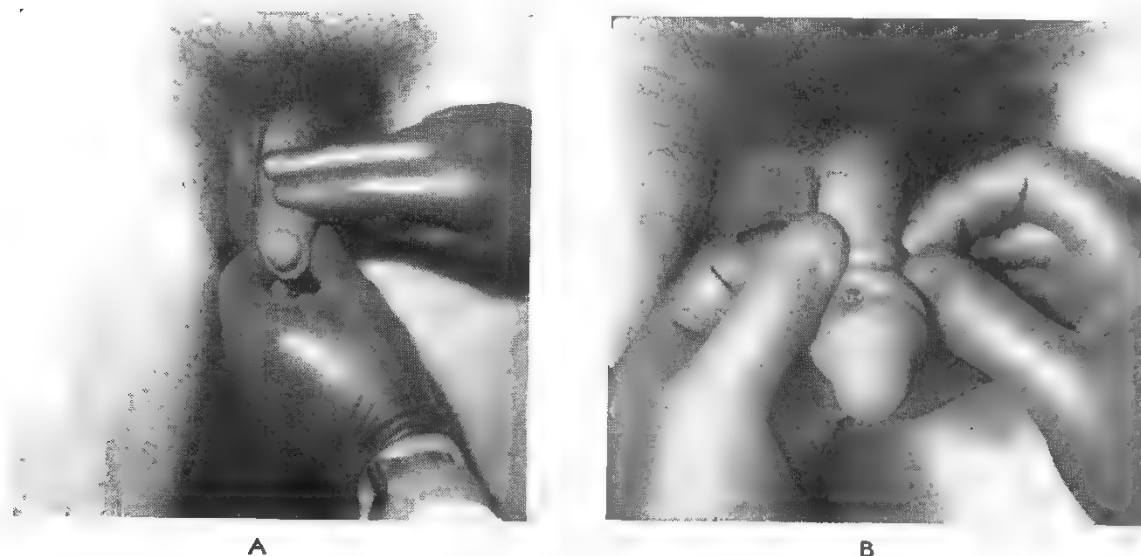


Fig. 635.—A, Palpation of the dorsum of the shaft of the penis reveals an indurated subcutaneous cord. B, On retracting the prepuce a typical Hunterian chancre is displayed. Case of thrombosis of the dorsal vein.

**Thrombosis of the Dorsal Vein of the Penis** gives rise to a physical sign that is absolutely characteristic. On palpation (*Fig. 635 A*), in the subcutaneous tissues of the middle line of the dorsum of the penis there is what feels like a 'pipe cleaner' as a patient graphically described it. Unless the clinician knows of the existence of this condition, he will be puzzled. Retraction of the prepuce, if present, usually reveals the cause of the thrombosis at once (*Fig. 635 B*).

**Persistent Priapism.**—The penis remains erect and is painful. Most often the erection is due to idiopathic thrombosis occurring in the prostatic venous plexus; less frequently it is associated with leukaemia or sickle-cell anaemia. Secondary malignant deposits in the corpora cavernosa or the pelvis account for a small proportion of cases. In another, completely different, category are cases of priapism due to spinal injury or disease. There is unlikely to be any difficulty in associating a spinal injury with priapism, but when organic disease of the central nervous system is the cause, often a full neurological examination is required to elucidate it.

\* *Bubonulus*. Latin = a small bubo. Occurs in the course of a lymphatic vessel, especially of the penis. Is a manifestation of lymphogranuloma inguinale.

**Induratio Penis Plastica** (Peyronie's Disease) is uncommon. Lateral curvature of the erect penis is the only symptom, except in the early stages, when pain on erection is experienced. A localized, painless induration about half-way down the dependent part of one or both corpora cavernosa, but never in the corpus spongiosum, is pathognomonic of the condition. When the area is rolled between the finger and thumb the impression gained is that the spongy tissue has been converted into soft cartilage. The cause is unknown.

**Palpation of the Floor of the Male Urethra**, from the glans to the triangular ligament (*Fig. 636*), often yields valuable information, for instance:—

*Fig. 636.*—Palpating the floor of the urethra. This should be done systematically from the external urinary meatus to the triangular ligament. Note that in order to palpate the deep urethra it is necessary to invaginate the scrotum.



*A Urethral Stricture* can sometimes be felt from without, and a favourite site is the peno-scrotal junction.

*Carcinoma of the Urethra.*—This rarely complicates a long-standing urethral stricture but can occur *de novo*. As a rule the only symptom is a profuse urethral discharge, which later becomes blood-stained. When, in addition, there is considerable localized induration in the floor of the urethra, and because a urethral discharge is so unusual in cases of inflammatory stricture, carcinoma of the urethra should spring to mind. If, as it is hoped, this deduction is made the clinician will forthwith palpate the inguinal lymph-nodes—often these are implicated early by metastases.

*Urethral Diverticulum* (Urethral Pouch).—The pouch can be seen on the under-surface of the penis, and if it is not obvious it usually can be made apparent when the patient interrupts the urinary stream by pinching the glans. On palpation, a soft swelling will be felt in the midline, and on compressing it, urine, sometimes purulent, issues from the external urinary meatus.

*Penile Periurethral Abscess.*—A rounded, pea-like swelling under the skin, attached to the urethral floor, is characteristic of a closed abscess of a para-urethral (Littre's) gland. Later it becomes tender and fluctuant. Such an abscess is often situated about the middle of the penile urethra.

### THE MALE PERINEUM

The male perineum, being hidden by the scrotum, is liable to escape scrutiny unless the practice is made of examining this region with the patient in the spread-eagle position and the scrotum elevated. Conditions in which cardinal diagnostic assistance is derived from displacing the scrotum upwards are depicted in *Figs. 637–640*, and a fifth illustrated in *Fig. 593*, p. 341.

Referring to *bulbous periurethral abscess*, in only 50 per cent of cases does it occur behind a urethral stricture. In its most acute form it gives rise to spreading cellulitis along those planes so well recognized for superficial extravasation of urine (*see Fig. 595*, p. 342).

Examination of the bulbo-urethral (Cowper's) glands is described on p. 369.

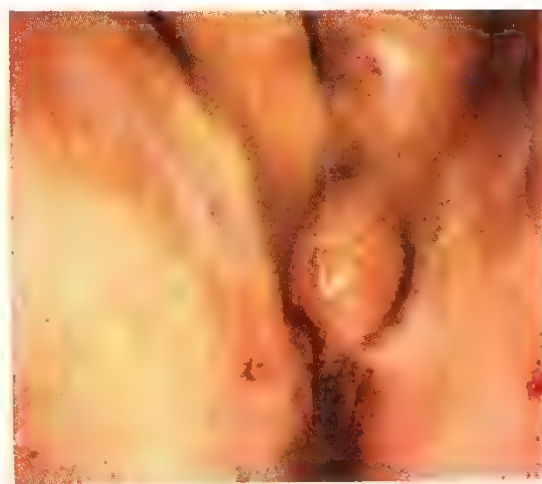
FRANÇOIS DE LA PEYRONIE, 1678–1747, *Surgeon to Louis XV, and Founder of the Royal Academy of Surgery, Paris. Mainly due to him Paris became a great surgical centre in the eighteenth century.*  
ALEXIS LITRE, 1658–1725, *Surgeon and Anatomist, Paris; spelt his name without an accent.*  
WILLIAM COWPER, 1666–1709, *London surgeon who published anatomical works in a sumptuous fashion.*



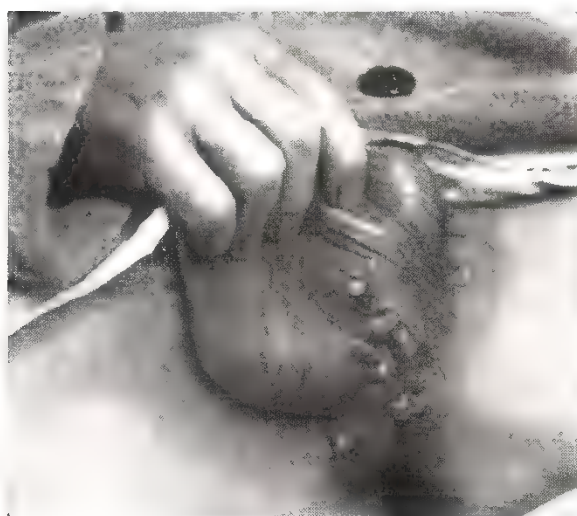
## SOME CONDITIONS REVEALED BY INSPECTING THE MALE PERINEUM



*Fig. 637.*—Bulbous periurethral abscess.



*Fig. 638.*—Abscess of the left bulbo-urethral (Cowper's) gland.



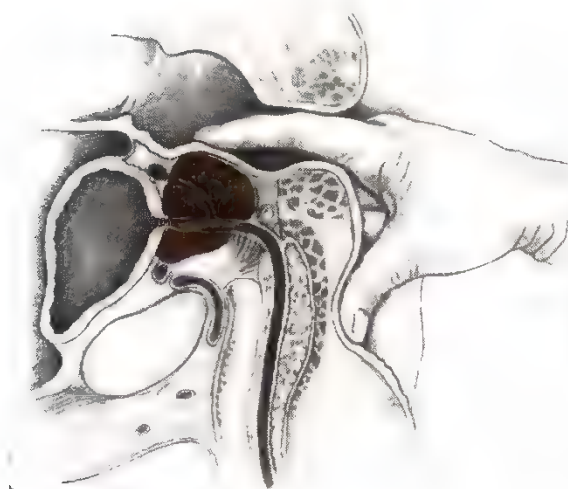
*Fig. 639.* 'Watering-can' scrotum and perineum. Case of neglected stricture of the urethra.



*Fig. 640.*—Perineal testis.

## THE PROSTATE AND ITS ADNEXA

As a prelude to palpation of the prostate, the patient is asked to empty his bladder. When possible the act of micturition should be watched, for loss of projectile power is significant. It is inadvisable to examine the prostate before a general examination of the abdomen has been conducted at which special



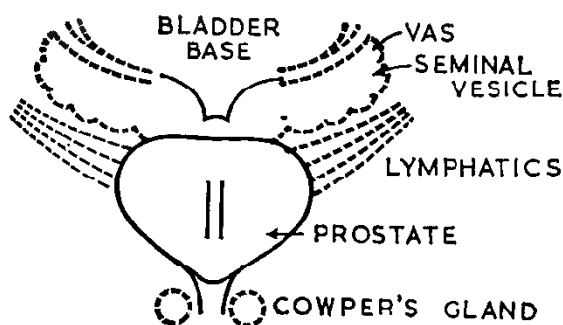
*Fig. 641.*—Palpation of the prostate with the patient in the knee-elbow position. Each lateral lobe is palpated, paying particular attention to its consistency.

attention should be paid to the bladder, for if by palpation and percussion it is found to be distended in spite of urination, not only is that discovery of cardinal importance, but it also foretells that the rectal findings on the state of the prostate are likely to be unreliable (*see* p. 347).

Routine examination of the prostate is performed best with the patient in the knee-elbow position (*Fig. 641*). The finger, well lubricated, is introduced slowly in the manner described on p. 279.

**Visualizing the Parts to be palpated.**—It is essential to have a clear conception of the relationship of structures about the prostate to the palpating finger, and to know what can be felt normally. The prostate feels firm and elastic, and this is in sharp contrast with adjacent tissues. Each of its ovoid lateral lobes, which are separated by a median furrow, is about the size of the distal segment of the thumb. They project posteriorly but very slightly.

Passing the finger *downwards* along this median furrow, immediately after the prostate has been traversed, the finger impinges upon a soft area—here lies the membranous urethra. On each side of the mid-line at this point are situated the bulbo-urethral (Cowper's) glands. Sliding the finger *upwards* along the furrow, a little to each side of the superior limit of the prostate lie the seminal vesicles within the reach of the finger. A normal vesicle cannot be felt. Between the vesicle and the lateral lobe of the prostate of each side there is a sulcus which is traversed by the lymphatics leaving the prostate. These anatomical facts must be understood clearly and



*Fig. 642.*—The parts in *black* are felt normally, those in *red* only when they are diseased. (*After Thomson-Walker.*)

*Fig. 642* visualized before diagnosis of the abnormal is attempted.

Before expressing an opinion on the size of the prostate, it is necessary to be certain that the bladder is empty. Especially in the case of acute retention of urine the posterior surface of the full bladder can be mistaken for a large prostate. Affections of the prostate, translated into terms of palpation, can be described as follows:—

**Prostatitis.**—*Acute.* Palpation must be very gentle. An enlarged, swollen, tense but slightly oedematous, tender, hot prostate is diagnostic of acute prostatitis. Sometimes acute prostatitis is associated with acute seminal vesiculitis. If an abscess\* or abscesses have formed they will be detected as areas of softening.

*Chronic Prostatitis* is common. It can follow acute prostatitis, or be chronic from the commencement. While the diagnosis usually is readily determined, it is not always an easy matter to decide if the patient's symptoms are due to the prostatic infection. The gland may be slightly enlarged or normal in size. Similarly, tenderness may be slight or absent. Frequently the prostate is somewhat nodular, with occasional boggy spots. Clinical differentiation from carcinoma may prove extremely difficult. Microscopical examination of the fluid expressed by prostatic massage (*see* p. 369) for pus cells is the only reliable method of demonstrating the infection.

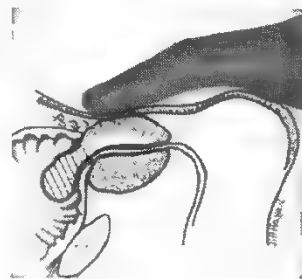
\* The fact that rectal or perineal pain persists after antibiotic treatment of acute prostatitis suggests that an abscess has formed, particularly in a diabetic.



**Tuberculous Prostatitis.**—Almost always one, and sometimes both, seminal vesicles are implicated. Both these structures are hard, irregular, and can be best described as ‘craggy’. The vas deferens is nearly always involved (*see* p. 379).

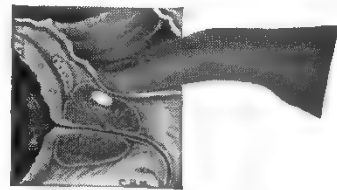
**Benign (Adenomatous) Enlargement of the Prostate.**—In benign enlargement affecting the lateral lobes, increase in their size is evident. They are smooth, convex, and typically elastic, but because all grades of fibro-adenosis occur, the fibrous element may give a firm consistency. In all cases the rectal wall can be made to move over the prostate. While as a rule some degree of enlargement is apparent to the examining finger, it must be realized that the enlargement is frequently mainly, and sometimes entirely, confined to the middle lobe, viz. —————→

The palpating finger should pass over the entire gland. It will note the presence of the median groove, which may, or may not, be distorted by bosselations in its vicinity. Some idea of the size of the prostate can be formulated by running the finger from the apex to the base of the gland, and also from side to side.



**Carcinoma of the Prostate.**—The chief obstacle to early diagnosis is the absence of symptoms, and the chief hope of early recognition is the routine examination of the prostate in men over 45 years of age who present for life assurance, or for conditions not referable to the prostate. Other difficulties are that when the carcinoma commences deep in the lateral lobes, or in the middle lobe, it cannot be felt per rectum, neither is it possible to be certain of the diagnosis when malignancy arises in an area of benign hypertrophy. In an average case, however, the carcinoma commences in the posterior part of the gland near the surface, and can be recognized as a rounded area of induration beneath the capsule, viz. —————→

contrasting in consistency with that of the normal prostate. As it increases in size, the nodule acquires stony hardness. Somewhat later the vertical median groove between the lateral lobes (*see* Fig. 642) becomes obliterated. Further spread takes place, particularly in an upward and outward direction around the seminal vesicles, giving rise to extensions shaped like the horns of a bull, which are quite characteristic. These are due to involvement of lymphatics (*see* Fig. 642). The normal mobility of the prostate gland becomes reduced *pari passu* with the extracapsular extension of the neoplasm. As time goes on extension takes place in a backward direction, producing a stony-hard irregular mass obliterating the normal contour and the sulcus of the gland. Finally, although most cases of carcinoma of the prostate commence *per primam*, a few arise in a prostate already the seat of adenomatous enlargement; therefore always regard with particular suspicion an area of discrete induration in benign enlargement of the gland.



**Contracture of the Bladder Neck (Fibrous Prostate).**—The prostate is either normal in size or, more usually, smaller than normal. The gland is distinctly harder than usual, but its shape is preserved and its contour smooth. It is this smoothness that serves to differentiate the condition from carcinoma, but when the gland is stony hard laboratory tests and biopsy are required to eliminate a scirrhus carcinoma.

**Prostatic Calculi.**—When these small stones are near enough the periphery to be detected by palpation, they are so embedded in the fibrous stroma as to

simulate the irregular hardness of a carcinoma. Very occasionally the stones are comparatively free, and they impart to the palpating finger an impression described so aptly by Erichsen as of 'beads in a bag'.

**Bimanual Palpation of the Prostate.**—Where the diagnosis is not certain, bimanual palpation of the prostate (*see Fig. 516*, p. 277) in the lithotomy position is a valuable procedure. In a thin subject with the bladder completely empty, an intravesical lobe sometimes can be felt. When pressure is exerted on the apex of the prostate by the finger in the rectum, it will be found that a gland which is the seat of benign enlargement possesses a limited degree of mobility. Fixity of a carcinomatous prostate becomes most evident by this manœuvre. Residual urine in a post-prostatic pouch can sometimes be felt as a fluctuating swelling above the prostate. Good access to the seminal vesicles is also afforded. It is usual to carry out this examination in conjunction with cystoscopy.

**Examination of the Seminal Vesicles.**—There is probably no method of physical examination that is more dependent upon the clinician's physical attributes, for if he is endowed with a long finger, these structures can be palpated per rectum readily. It seems probable, however, that a short index finger is not the chief reason why vesiculitis is overlooked; rather is it because so often no attempt is made to discover it. Usually the knee-elbow position is adopted for the examination of the seminal vesicles, but when the patient is obese or the prostate is enlarged, the Picker position (*Fig. 643*) is more practicable. The patient stands and leans forward, grasping a low chair or stool. This position is advantageous when a specimen of the contents of the seminal vesicles is required.



*Fig. 643.*—The Picker position for examining the seminal vesicles.

A seminal vesicle may be enlarged or fibrous as a result of chronic inflammation, which usually is non-gonococcal in origin, by which is meant that the infection is an extension of abacterial urethritis, *Trichomonas vaginalis* infestation, or a mixed infection. A *tuberculous* vesicle gives to the palpating finger a very characteristic sensation, which is best described as 'craggy'.

**Palpation of the Bulbo-urethral (Cowper's) Glands.**—Cowperitis, both acute and chronic, is often mistaken for prostatitis or vesiculitis. The diagnosis is often missed for lack of a simple examination. On passing the forefinger into the rectum and placing the thumb first on one side and then on the other of the median raphe of the perineum the bulbo-urethral glands can be palpated (*Fig. 644*). In acute cases the least pressure causes excruciating pain—in chronic cases the enlarged gland can be felt. It varies in size from 0.5 to 2 cm., is hard, and feels not unlike a malignant lymph-node (Harkness).

**Prostatic Massage as a Test of Posterior Urethritis. Prostatitis, or Seminal Vesiculitis.**—The prostate and seminal vesicles are massaged as shown in *Fig. 645*, the patient being in the knee-elbow position. Slow, firm strokes with the pressure applied evenly are employed, after which the contents of the penile urethra are milked down. The external urinary meatus is examined for a bead of the fluid thus expressed (*Fig. 646*) and the macroscopical characters of the bead noted, after which microscopical and bacteriological examination are arranged.

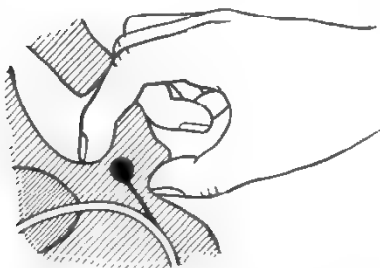
Prostatic massage in acute or suspected tuberculous disease is forbidden absolutely, but if,

SIR JOHN E. ERICHSEN, 1818–1896, *Surgeon, University College Hospital, London.*

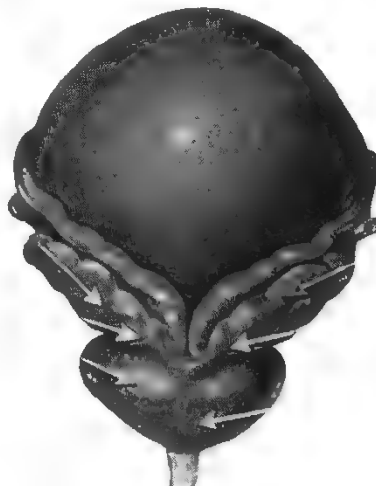
RUDOLF PICKER, 1876–1944, *Head of the Urological Service, Central Polyclinic, Budapest, Hungary.*

ARTHUR H. HARKNESS, 1889–1970, *Director of Venereal Department, St. Peter's Hospital, London.*

as a result of the palpation of the prostate, a drop of pus appears at the meatus, it should be collected on a slide and examined microscopically.



*Fig. 644.*—Bidigital palpation of the bulbo-urethral glands. The index finger is placed in the rectum, and the thumb in the perineum to one side of the middle line. An enlarged gland can be felt between the finger and thumb.



*Fig. 645.*—Directions in which to massage the prostate and seminal vesicles.



*Fig. 646.*—Prostatovesicular massage.

### THE SCROTUM

*Soft Pitting Oedema* of the scrotum is seen in decompensating cardiac cases (see p. 343) and in chronic nephritis.

*Extravasation of Urine* (see p. 342) and *Spreading Cellulitis* (Fig. 647), often arising from a bulbous periurethral abscess (see Fig. 637), each give rise to scrotal oedema of a more solid variety than the foregoing. Owing to the extreme laxity of the scrotum, subcutaneous cellulitis thereof is relatively painless, although it is tender.

*Following Retropubic Prostatectomy.*—Oedema of the scrotum is an uncommon complication, and is due to thrombosis of the pelvic veins.

*Subcutaneous Emphysema of the Scrotum* (see p. 16 and Fig. 372, p. 187).

*Idiopathic Gangrene of the Scrotum* (Fournier's Gangrene).—The three cardinal characteristics of this distinctly rare disease are: (a) Sudden appearance of scrotal inflammation in the midst of apparently good health; (b) Rapid onset of gangrene (Fig. 648); and (c) Total absence of any of the usual causes of gangrene. The condition commences as an acute inflammatory oedema of the scrotum, and is followed in a matter of hours or days by sloughing gangrene. Although usually idiopathic, the urine should always be tested for sugar.

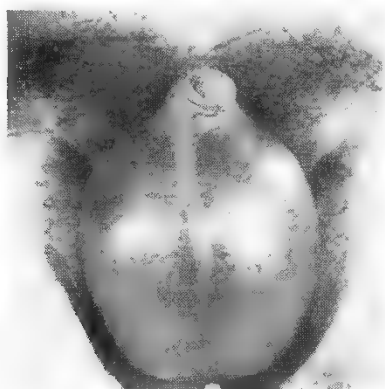


Fig. 647.—Subcutaneous cellulitis of the scrotum.



Fig. 648.—Fournier's idiopathic gangrene of the scrotum.

*Non-filarial Elephantiasis* can occur following bilateral extirpation of inguinal lymph-nodes, and as a result of extensive metastases in, or from, fibrosis following inflammation of these nodes.

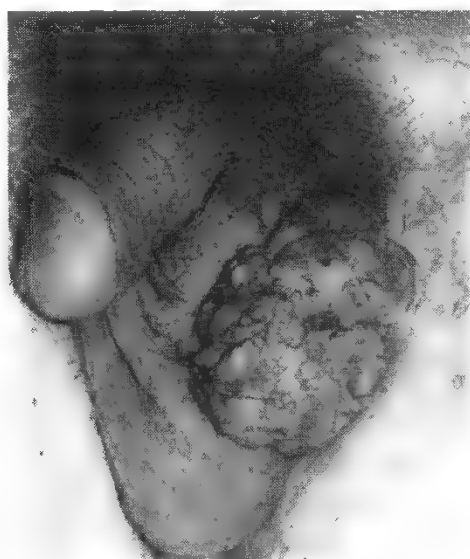


Fig. 649.—Carcinoma of the scrotum.

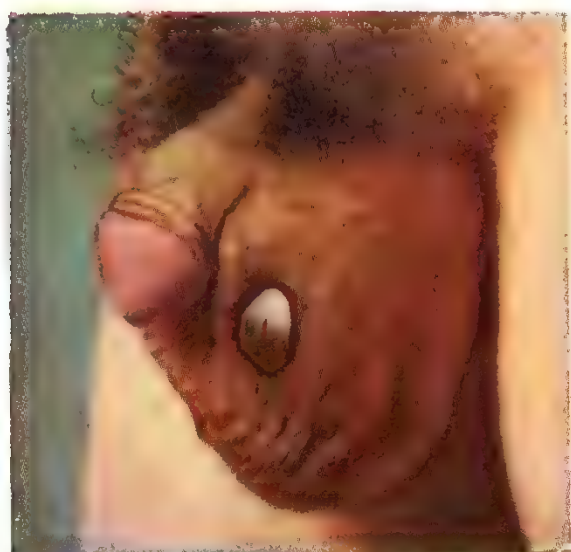
*Tropical Elephantiasis* is caused by the infestation of the relevant lymphatics by *Wuchereria bancrofti*, which is transmitted by mosquito bites. The larva of this parasite can only be found in the peripheral blood at night, or when the patient is asleep, be it night or day. Secondary hydroceles are a usual accompaniment of tropical elephantiasis.

In the above two conditions the skin of the penis is involved also.

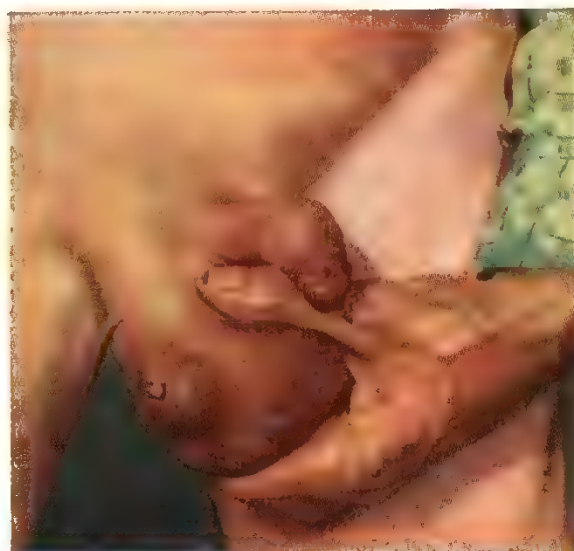
**Carcinoma.**—About 50 per cent of cases of carcinoma of the scrotum (*Fig. 649*) occur in workers in pitch, tar, or bitumen,\* or those whose occupation occasions shale mineral oil coming into contact with the scrotum, e.g., cotton mule-spinners. It should be remembered that it takes upwards of twenty years for the carcinoma to become manifest as a result of exposure to these carcinogens. Therefore always go into the question of the patient's previous employment. In early doubtful cases a biopsy should be undertaken.

**Sebaceous Cysts** occur rather frequently in the scrotum. Often they are small and multiple. Should one large cyst suppurate it emits a peculiarly obnoxious odour. Sometimes a suppurating cyst is mistaken for a carcinoma.

**Intertrigo** (chafing) is frequently to be found on opposing surfaces of the scrotum and the thigh in obese men.



*Fig. 650.*—Gumma of testis commencing to ulcerate.



*Fig. 651.*—Skin of the scrotum adherent posteriorly where a sinus has developed. Case of tuberculous epididymitis.

### EXAMINATION OF THE TESTIS

The patient should stand in a good light before the seated clinician. In this position the left testis usually hangs fractionally lower.†

To commence with, ascertain if the scrotum is anchored at any point to the underlying testis. Should it be thus tethered anteriorly, it is slight contributory evidence of gumma (*Fig. 650*); if posteriorly, of tuberculosis (*Fig. 651*); whilst a new growth may invade any portion of the overlying skin, the anterolateral aspect being the site of election. By the time the scrotum is implicated visibly, underlying testicular disease is far advanced.

**Palpation.**—In order to carry out a thorough examination of the testis, it is useful to palpate its constituent parts in a definite order (*Fig. 652*).

\* In days gone by carcinoma of the scrotum was so common in chimney-sweeps that the disease was known as 'chimney-sweep's cancer.'

† In transposition of the viscera the right testis hangs lower, a useful clinical clue (Birch).



1. Palpate the body and compare it with the unaffected side.
2. While doing this, bear in mind the relationship of the tunica vaginalis. It is blended intimately with the anterior surface of the body.
3. Palpate the epididymis, body, globus major (head), and globus minor (tail).
4. Palpate the spermatic cord up to the external abdominal ring. The technique has been described accurately by Lockwood: 'Pass the index finger under the neck of the scrotum, pinch the thumb down upon it, and slip the constituents of the scrotum through your fingers from within outwards. You ought to feel the vas, which is like hard whipcord. You will feel a number of other small cords and strings and fibres, which you cannot define. You may possibly be able to feel the

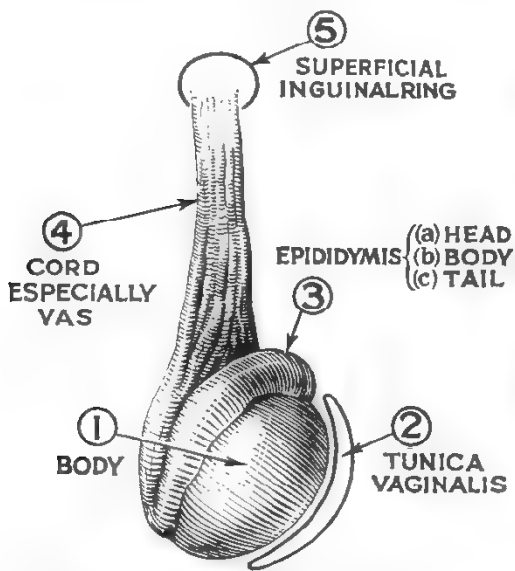


Fig. 652.—Order in which the constituent parts of the testis are palpated.



Fig. 653.—Palpating the vasa. Compare the size of the vas on each side.

nerves of the cord, more especially the genitofemoral and branches of the ilio-inguinal, but I think the fibres which you feel are probably the fibres of the cremaster muscle. Unless you feel these things clearly and accurately, you are not feeling a normal spermatic cord.'

**Testing for a Minor Degree of Thickening of the Vas.**—Using both hands, both vasa should be palpated simultaneously, and as these whipcord-like structures pass through the fingers, their relative sizes are estimated (Fig. 653).

**Test for Translucency.**—Anyone who is in close touch with clinical surgery will have seen cases where the diagnosis has been vitiated by failure to carry out the test for translucency, or by carrying it out inefficiently. In the case of an intra-scrotal swelling the first essential is to make the swelling tense by grasping the neck of the scrotum between the fingers and thumb. A pocket torch is applied to the distal side of the swelling and most hydroceles and cysts of the epididymis can be diagnosed irrefutably at once because of their translucency (see Fig. 661). There are cases in which the sign is doubtful, especially in sunlight. To go to the trouble of pulling down a window blind or to take the patient to a dark room frequently diminishes doubt. On transillumination of a large, tense hydrocele the relationship of the testis to the cyst, indeterminable by palpation, becomes apparent

as a dark oval shadow, usually situated *behind* the illuminated cyst. Transillumination is *the* sign in the diagnosis of hydrocele.

The fallacies of efficient transillumination in the diagnosis of hydrocele are few. Obviously, if the walls are thick or calcareous the sign will be negative. Another possible error is in the case of a young child, particularly an infant (a vaginal hydrocele is common in the male newborn baby). At this time of life, if small intestine distended with gas is present in the sac of an inguinal hernia, so gossamer-like is the wall of gas-containing gut that the swelling to which it gives rise is likely to be translucent. However, usually an inguinal hernia in an infant is reducible, while a vaginal hydrocele is not.

**Testicular Sensation.**—When the normal testis is squeezed gently between the finger and thumb the patient experiences a peculiar ‘sickening pain’. This sign is mentioned only to condemn it; apart from the pain it occasions, it is dangerous, at least on theoretical grounds, if the enlarged testis is neoplastic, for malignant cells may be squeezed into the venous or lymphatic circulation. Syphilitic orchitis, in which testicular sensation is lost, is now rare, and in any case can be confirmed with a blood-test.



Fig. 654.—Imperfectly descended testis at the left superficial inguinal ring.

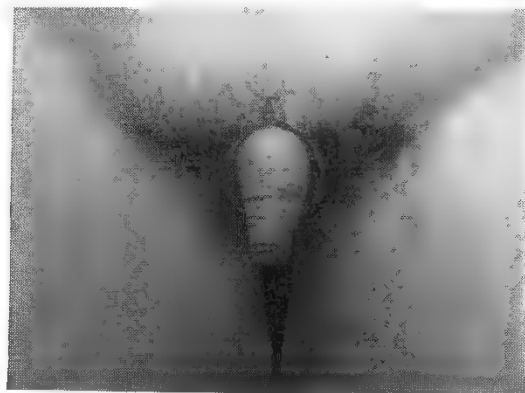


Fig. 655.—Cryptorchid\* at puberty. The scrotum is empty, contracted, and barely perceptible.

**Examination of the Regional Lymph-nodes.**—The lymphatic drainage of the testis passes up the spermatic cord, and follows the spermatic artery to the para-aortic nodes just below the origin of the renal arteries. It should be noted that the lymphatic vessels of the testis have no connexion either with the inguinal lymph-nodes or with the contralateral channels in the pelvis. It therefore follows that when the testis is the seat of an advanced neoplasm, secondary deposits are to be expected above the level of the umbilicus, i.e., enlarged para-aortic lymph-nodes may be palpable in the epigastrium. Advantage may be taken of the knee-elbow position to seek for enlargement of these nodes. The supraclavicular lymph-nodes are occasionally implicated (*see p. 141*).

#### IMPERFECTLY† DESCENDED TESTIS

*A mal-descended testis is one that cannot be made to touch the bottom of the scrotum.*

*a. In Adolescents and Adults.*—Certainly most patients with an imperfectly descended testis have a superadded inguinal hernia, but it should not require the

\* A cryptorchid is a male whose testes are hidden from view and impalpable, i.e., they are situated retroperitoneally above the level of the deep inguinal ring.

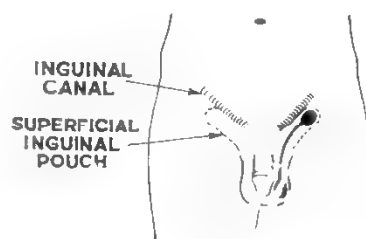
† An undescended testis, strictly speaking, is one which has not moved from the place in which it had its origin, i.e., just below the kidney. Testes in this position are excessively rare.

peculiar talents of a Sherlock Holmes to detect that there is but a solitary testis in the scrotum. Nevertheless, over and over again the swelling produced by a testis lodged near the superficial inguinal ring (*Fig. 654*) has been diagnosed as an inguinal hernia without the location of the testis being questioned.

On the other hand, when both testes fail to reach their normal destination and the patient is approaching, or has attained, years of maturity, the fact that the scrotum is empty and undeveloped (*Fig. 655*) is too arresting to escape notice.

When seeking a retained testis a light touch over the upper part of the inguinal canal, especially when the patient is examined in the upright position, sometimes reveals a mobile tell-tale ovoid lump which up to that time had defied definition.

*b. In Juvenile Patients.*—In infancy imperfect descent of the testis, bilateral more often than unilateral, is common. At birth Scorer found it in 2·7 per cent of full-term babies but in no less than 20 per cent of premature infants. During the first 3 months of life the testes fail to descend spontaneously in only a few of the babies mentioned above who are born with mal-descent, so that the overall figure is only 8 per 1000 births (0·8 per cent). For these reasons the clinician's concern is centred on those above 3 months after which further descent does not occur (Scorer). At this juncture it is essential to stress that numerous juvenile patients are believed to be suffering from 'un-descended' testes when the only abnormality present, if abnormality it can be called, is a retractile testis or testes.



*Fig. 656.*—Mechanism of the disappearing testis. (After Browne.)

**Retractile Testes.**—In infant boys intermittent contraction of the cremaster muscle pulls the testis into the inguinal canal, or, as Browne would have it, the testis retracts into the superficial inguinal pouch, a space filled with loose areolar tissue lying between the fascia of Scarpa and the external oblique aponeurosis (*Fig. 656*). It is these disappearing testes that have beguiled clinicians. Retractable



*Fig. 657.*—Retractile testis (*right*) manoeuvred from obscurity to the bottom of the scrotum.

testes can be segregated from imperfectly descended ones by correct technique, but in refractory children more than one examination may be required.

The examination should be conducted in a warm room, with warm hands. First of all scrutinize the scrotum: when the scrotal skin of the affected side is less rugose than the normal side, it is probable that that half of the scrotum never

CHARLES G. SCORER, *Contemporary Surgeon, Hillingdon Hospital, London.*

SIR DENIS BROWNE, 1892–1967, *Surgeon, Hospital for Sick Children, Great Ormond Street, London.*

ANTONIO SCARPA, 1747–1832, *Professor of Surgery, Modena, and Professor of Anatomy, Pavia, Italy.*

contained a testis (Macrosson). The pulps of the index and middle fingers are placed over and below the region of the deep inguinal ring. Exerting moderate, even pressure, the fingers are drawn downwards in the line of the inguinal canal. In this way a testis of the retractile type will be thrust into the neck of the scrotum, where the awaiting finger and thumb of the other hand will be ready to grasp it. By this manœuvre the retractile testis can be made to touch the bottom of the scrotum (*Fig. 657*). In difficult cases the 'chair test' (Orr) should be tried: the young patient is asked to sit on a chair and hug his knees to his chest—

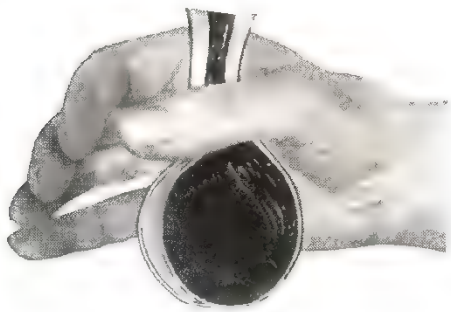
Pressure thus directed on to the inguinal canal causes a retractile testis to descend into the scrotum.



**Ectopic Testis.**—This condition, although given undue attention in surgical texts is, in fact, rare. If the scrotum on one or both sides is empty and an imperfectly descended testis is not found in the inguinal canal, look for an ectopic testis in the perineum (*see Fig. 640*), at the root of the penis, and in the femoral triangle. It is permissible to test gently for testicular sensation (*see p. 374*) if such a swelling is found.

### THE DIFFERENTIAL DIAGNOSIS OF INTRASCROTAL SWELLINGS

Of all organs, the testis, separated as it is from the examining fingers by little more than a covering of loose skin, is the most accessible. Consequently, one would



*Fig. 658.*—As shown, it is possible to get above an intrascrotal swelling when that swelling arises from the testicular apparatus.

suppose the diagnosis of intrascrotal swellings to be a comparatively simple matter. On the contrary some testicular swellings are most difficult to diagnose with confidence. However, many are misdiagnosed, not because of inherent difficulties, but because of slipshod methods of examination, or illogical interpretation of the physical signs elicited.

#### Traps for the Unwary.—

*a.* Because there is a swelling within the scrotum, it does not signify that it arises in connexion with the testicular mechanism. The first question should always be, 'Can I get above the swelling?' (*Fig. 658*).

*b.* A secondary hydrocele may mask underlying testicular disease. If doubt exists as to the condition of the underlying parts, it is advisable to aspirate the fluid there and then, and to palpate the unmasked organ. The fluid withdrawn from a cyst connected with the testis throws considerable light on the diagnosis (*Fig. 659*).



*Fig. 659.*—A, The fluid withdrawn from a vaginal hydrocele resembles normal urine; B, That from a spermatocele is like barley water; C, That from a cyst of the epididymis is crystal clear, like water.

c. About 1 man in every 14 has an anteverted testis,\* by which is meant that the epididymis is in front instead of behind. Unless the possibility of this anatomical variation is recognized, the physical signs elicited are difficult to interpret and much confusion caused.

### TRANSLUCENT SWELLINGS

Determine the relation of the translucent swelling to the testicle. Sometimes the dark shadow of the body of the testis can be seen contrasted against the brilliantly

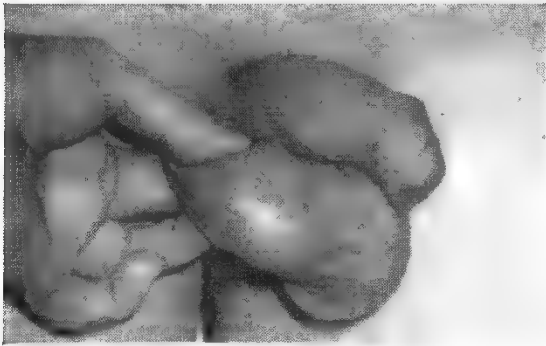


Fig. 660.—Cyst of the epididymis. With the scrotum stretched over it, the cyst is fixed between finger and thumb.

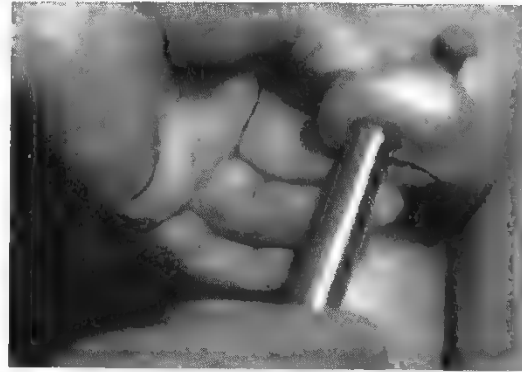


Fig. 661.—Transillumination from behind. A cyst of the epididymis will be found to be brilliantly translucent.

illuminated area. Another reliable method that is often possible is to identify the testis by palpation. A **vaginal hydrocele**† lies in front and to a variable degree above the body of the testis (Fig. 662, 2). If the translucent swelling is behind the body of the testis, it is most probably a cyst of the epididymis (Fig. 662, 3). This is more common than a spermatocele (Fig. 662, 4).

**Cyst of the Epididymis** usually is encountered in a middle-aged man. Often the swelling is small as compared with a hydrocele, but there are occasions when it is as large. The cyst is (unless the testis is anteverted) situated behind the body of the testis and when small, tends to slip about; therefore it should be grasped firmly between the finger and thumb to stretch the overlying scrotum tightly over it (Fig. 660). A pocket torch is then applied behind the cyst, which is illuminated most effectively (Fig. 661). Not infrequently the swelling is composed of an aggregation of small cysts which, when transilluminated, give a tessellated appearance not unlike that of a Chinese lantern. Cysts of the epididymis are frequently bilateral, but unequal in size.

**Spermatocele** may also be bilateral. As a rule it occurs in a globus major (the head of the epididymis) and is distinguished from a cyst of the epididymis by its softness and by the fact that, owing to the milkiness of its contents, it is not so brilliantly translucent.

**Cyst of an Appendix of the Testis** is a separate clinical entity. It forms a small globular swelling at the superior pole of the testis (Fig. 662, 5). It is usually unilateral, and always brilliantly translucent. The cyst is liable to undergo axial rotation (see Fig. 671, p. 384).

\* Findings based on the examination of 850 recruits by Waddy.

† This is so called in the British Commonwealth because it originates in the tunica vaginalis. In the U.S.A. it is known as a scrotal hydrocele—also a good term.



PHYSICAL SIGNS IN CLINICAL SURGERY  
THE DIFFERENTIAL DIAGNOSIS OF TESTICULAR SWELLINGS

- 1.—If, on this simple outline, the physical signs elicited are recorded, a reasoned diagnosis will be probable.
- 2.—Vaginal hydrocele.
- 3.—Cyst of the epididymis. Swelling tense. Often somewhat lobulated. May be in any part of the epididymis.
- 4.—Spermatocele. Same as 3, but not so lobulated, nor so tense, and not so brilliantly translucent. Often much larger than depicted. Sits on top of testis.
- 5.—Cyst of the hydatid of Morgagni perched on the upper and anterior surface of the testis.
- 6.—In an anteverted testis a vaginal hydrocele simulates a cyst of the epididymis. Largely an academic problem.
- 7.—Epididymo-orchitis. Epididymis enlarged and tender. Vas may be thickened.
- 8.—Tuberculous epididymo-orchitis. Epididymis craggy. Vas considerably thickened.
- 9.—Tuberculosis in an anteverted testis. Although rare, it is a source of diagnostic confusion.
- 10.—An advanced neoplasm. Body of the testis enlarged and irregular. Epididymis cannot be felt. Old clotted haematocoele gives rise to same signs.
- 11.—Early neoplasm. Any painless nodule in the body or even in the epididymis should be displayed to the light of day.
- 12.—Syphilis of the testis. Smooth, painless enlargement of the body. Gumma often shows a degree of irregularity.

Fig. 662.—Diagrams accompanying the notes of 11 patients with various testicular swellings.

**Congenital Hydrocele** can occur only when the processus vaginalis communicates with the peritoneal cavity and the orifice is too small to allow the development of an inguinal hernia. In the case of congenital hydrocele, when the scrotum is elevated the fluid in the pouch gravitates into the peritoneal cavity, usually slowly, but it returns to the sac when the erect posture is resumed. The presence of a congenital hydrocele in an adult signifies that there is an excess of serous fluid in the peritoneal cavity with all that this implies (*see Ascites*, p. 250).

#### NON-TRANSLUCENT SWELLINGS

**Acute Epididymo-orchitis.**—This is much the commonest form of inflammatory disease of the scrotal contents; it is unsafe to diagnose acute epididymo-orchitis at any age when there is no urethral discharge and no pus to be found when the urine is examined. In cases of acute epididymo-orchitis, usually it is possible to distinguish the enlarged epididymis from the body of the testis. In cases of torsion of the testis (*see* p. 381) it is unusual to be able to palpate the two structures separately. Reverting to the more usual acute epididymo-orchitis note that the scrotal contents are acutely tender and often greatly enlarged, the skin is diffusely reddened, and urinary *symptoms* are not invariably present.

**Acute Epididymo-orchitis of Mumps** develops in about 18 per cent of male sufferers, as a rule when the parotid inflammation is subsiding. The testis becomes swollen and painful. Especially in infants, epididymo-orchitis of mumps can occur without parotitis.

**Tuberculous Epididymo-orchitis.**—Except in the rare acute forms, the comparative absence of tenderness helps to differentiate tuberculosis from other forms of epididymitis. When the condition is fully established physical signs are characteristic (*Fig. 662, 8*). In early testicular tuberculosis there is often a loss of cutaneous elasticity as shown by smoothing out of the rugae consequent upon wasting of the cellular tissues beneath the dermis (Morson). Normally the testis can be moved freely within its coverings, particularly in an upward and downward direction. This movement is often restricted in tuberculosis. If supuration ensues, scrotal skin involvement soon occurs, usually at the back of the scrotum (*see Fig. 651*), but anteriorly in an anteverted testis (*Fig. 663*).



*Fig. 663.*—Abscesses of the anterior wall of the scrotum secondary to tuberculous epididymo-orchitis of a right anteverted testis.

Irrespective of whether genital tuberculosis presents in the epididymis or in the prostate and seminal vesicles, there is a well-marked thickening of the vas deferens most in evidence near the epididymis. Beading and irregular nodulation of the vas are not pathognomonic of tuberculosis; frequently it occurs in non-tuberculous infections.

**Rectal Examination** is essential if tuberculous epididymo-orchitis is suspected. Involvement of the seminal vesicle (*see* p. 369) is strong confirmatory evidence.

**Malignant Disease.**—Painless enlargement of the testis is the presenting sign in 75 per cent of patients, and in 15 per cent only is the initial symptom pain in the organ. A further clinically helpful statistic is that 95 per cent occur between 20 and 45 years of age. The most frequent starting-point of the growth is the lower part of the body of the testis. When there is just a hardness of the body of the testis or an unexplained nodule (*Fig. 662, 11*), even if that nodule is in the epididymis,

it should be exposed to the light of day. Should this course be followed the clinician will, from time to time, suffer humiliation, for an old clotted haematocele (*Fig. 662, 10*), an atypical tuberculous lesion (*Fig. 662, 9*), or even a gumma of the testis will be removed unnecessarily. With reasonable clinical acumen such mistakes, if one can call them mistakes, are few and are relatively unimportant.

*The Sign of the Vas* helps in the differential diagnosis between a testicular neoplasm and an inflammatory lesion which causes the vas to become considerably thickened; in neoplasms of the testis it remains normal in all respects. Note that this sign refers to the vas deferens, and not to the spermatic cord. In the case of a neoplasm of the testis, while the spermatic cord remains normal for a considerable time, as the neoplasm becomes larger, and therefore heavier, so the cord becomes more bulky, due to hypertrophy of the cremaster muscle and engorgement of the veins of the pampiniform plexus.

*Rectal Examination* reveals no abnormality in the prostate or seminal vesicles.

*Metastases.*—The necessity for searching for secondary deposits in cases of established or suspected malignant disease of the testis has been emphasized already (*see p. 374*). A chest X-ray is also essential.

*The Association of Maldescent of the Testis and Malignancy* (*Fig. 664*).



*Fig. 664.*—This gradually enlarging swelling had been noticed by the 22-year-old patient for eighteen months. The left testis was absent from the scrotum. The histological diagnosis of the excised tumour (*right*) was 'teratoma of the testis'. Maldescent of testes are many times more liable to malignancy than fully descended testes.

**Old Clotted Haematocele.**—Some patients presenting with an old clotted haematocele can recall neither a history of trauma to the testis nor of pain in the organ. An old clotted haematocele simulates a neoplasm of the testis closely. The differential diagnosis usually depends on the length of the history; a swelling present unaltered for some years cannot be a neoplasm.

**Syphilis** of the testis, in most communities now a rarity because of the effective treatment of syphilis in its early stages, is encountered in three forms:—

*Orchitis of Congenital Syphilis.*—Should an untreated congenital syphilitic boy be fortunate enough—if he can ever be called fortunate—to reach puberty, certain ills are liable to befall him. He tends to become lame, deaf, blind, and impotent. *Lame* because of Clutton's joints, *deaf* because of neurolabyrinthitis, *blind* because of interstitial keratitis, and *impotent* because of diffuse fibrosis and atrophy of the testes due to an attack of bilateral interstitial orchitis. Usually this occurs in infancy causing 'pigeon-egg testes'.

*Tertiary Interstitial Orchitis.*—When the condition is fully established, the testicle is rounded, densely hard, and completely movable in its scrotal covering (*Fig. 662, 12*). What better name could be given to it than the 'billiard-ball' testis?

**Gumma.**—In its early stages gives rise to signs much the same as those of neoplasm of the testis. A positive serological test for syphilis is, of course, most suggestive, but it should be remembered that it is possible for malignant disease to appear in a syphilitic patient.

**Varicocele.**—The enlarged veins of the pampiniform plexus are so obvious that it is unlikely that a varicocele (*Fig. 665*) will be confused with any other condition. A varicocele is nearly always left-sided. On light palpation the impression conveyed has been well likened to that of feeling a bag of worms.

After the examination in the erect position is concluded, the patient should lie down; when the testis is elevated the veins will empty. In cases of long standing, due to a minor degree of atrophy, the body of the testis of the affected side will be found to be somewhat smaller and distinctly softer than that of its fellow.

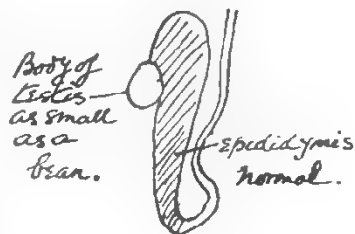
**Varicocele as a Cause of Subfertility.**—That oligospermia is a frequent accompaniment of a varicocele is fully substantiated, possibly because the increased blood-flow raises the intrascrotal temperature to the detriment of both testes, possibly due to the fact that so often a patient with a varicocele wears a jock-strap, or other support, and so conserves intrascrotal heat.

**Secondary Varicocele.**—Much academic attention has been paid to a rapidly oncoming varicocele as a sign of malignant disease of the kidney. This sign occurs only in 0.04 per cent of cases of malignant neoplasm of the kidney (Riches). In those cases in which it is present there is, as a rule, an easily palpable renal tumour so the sign is virtually valueless.



*Fig. 665.*—Varicocele. The left testis hangs much lower than the right. The patient also has a left inguinal hernia.

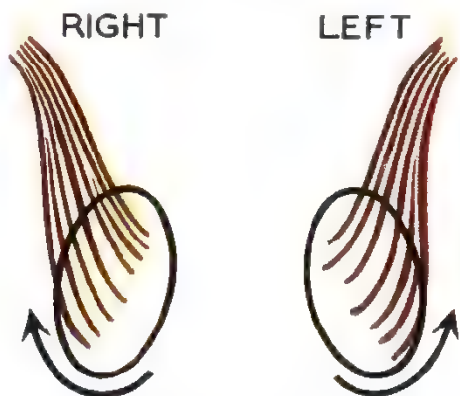
**Atrophy of the Testis.**—Commencing atrophy must be distinguished from under-development. Usually atrophy is unilateral. In partial atrophy the testis is smaller and softer than normal, as is found typically in long-standing cases of varicocele. Complete atrophy of the testis occurs: (1) Following infarction consequent upon torsion; probably this is the commonest cause. (2) Following epididymo-orchitis of mumps. (3) Following operation for: (a) inguinal hernia (especially in infants); (b) for varicocele; (c) orchiopexy. In this instance it must be assumed that the spermatic artery was damaged at the operation. The findings on palpation of a case of complete atrophy of the testis following herniotomy in early life are —————→ Bilateral incomplete atrophy occurs frequently in leprosy and hepatic cirrhosis, and always after oestrogen therapy for carcinoma of the prostate.



#### TORSION OF THE TESTIS (SPERMATIC CORD)

Should a boy or young man complain of sudden, intense pain in the inguinal region and of vomiting, and upon examination the testis on that side is found to be enlarged and tender, torsion of the testis should be the *first* thing to cross the clinician's mind. In early cases the spermatic cord will be found thickened, and on

occasion twists in the cord can be felt distinctly. Regarding the direction of the torsion, a simple rule almost invariably correct (Sparks) is that the twist is *away* from the midline, i.e., clockwise on the right, anti-clockwise on the left (*Fig. 666*), owing to the direction of the fibres of the cremaster muscle.



*Fig. 666.*—Showing the direction of the twist in torsion of the testes; the fibres of cremaster muscle are shown in brown.

There are, however, on numerous occasions, departures from this classic picture. In the first place quite frequently the onset is not sudden, and instead there is a dull ache of gradually increasing intensity in the hypogastrium in the region of the deep inguinal ring, or even in the loin (Smith). Secondly, it is not rare for torsion of the testis to occur in infancy, and even at birth, and except for screaming, there is little to call attention to the condition until the corresponding half of the scrotum becomes reddened by inflammation. Torsion of the testis remains unrivalled among surgical emergencies for the frequency with which it is mis-diagnosed.

Broadly speaking, all cases fall into one of two categories:—

**1. Torsion occurring in an Imperfectly Descended Testis** is almost impossible to distinguish by physical methods from a strangulated inguinal hernia; indeed, there is no reliable sign by which the diagnosis can be rendered even highly probable. All that is required of the clinician is to note the absence of the testis in the scrotum of the affected side, and arrange that the painful swelling of the inguinal canal be operated on as soon as possible. An indecisive preoperative diagnosis of ‘? torsion of an imperfectly descended testis’, ‘? strangulated inguinal hernia’ is wise.

**2. Torsion occurring in a Completely Descended Testis.**—This must be distinguished particularly from acute epididymo-orchitis. To add to the difficulty, in addition to the fact that the local signs of inflammation may simulate exactly those of acute epididymo-orchitis (*Fig. 667*), the temperature is consistently raised. Because so often the patient is a boy between the ages of 10 and 15 it is reasonable to expect the clinician, before pronouncing the diagnosis of epididymo-orchitis, to reason thus: Here is a boy who has no history of dysuria, no signs of



*Fig. 667.*—Torsion of the testis of 24 hours' duration in a boy aged 15. The inflamed acutely tender testis and scrotum simulate acute epididymo-orchitis exactly.



a urethral discharge, no pus to be found when the urine is examined: there have been no cases of mumps at his school or in the district: no swelling or tenderness of the prostate is detected on rectal examination, and the seminal vesicles are impalpable. Why on earth should he be suffering from a *bacterial inflammation* of the testis?

**Confirmatory Signs of Torsion of the Testis.—**

1. The affected testis *lies higher than its fellow* (Fig. 668) as a result of the twisting of the spermatic cord or because of spasm of the cremaster muscle. This sign is especially valuable on the left side (Deming).

2. *Angell's Sign*.—The development anomaly allowing of torsion, namely the presence of a mesentery between the testis and the epididymis, is almost



Fig. 668.—Upward retraction of the left testis in a case of torsion of the testis of 3 hours' duration.

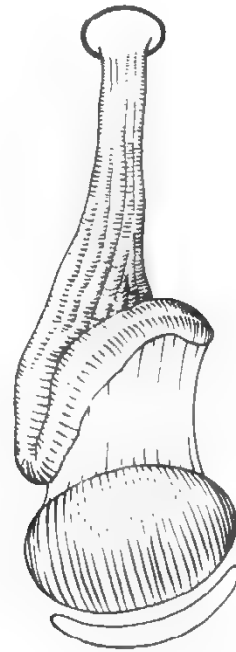


Fig. 669.—The testis is found to lie horizontally (cf. Fig. 652) on the opposite side to a torsion.

invariably bilateral. If the patient is examined *standing*, the *opposite* testis will be found to lie horizontally instead of in the normal vertical (Fig. 669). The sign is usually obscured on the affected side.

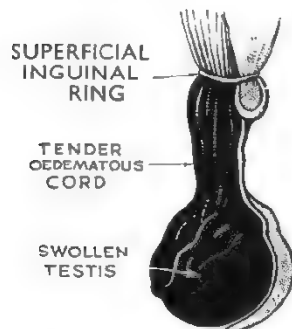
3. In cases of epididymo-orchitis sometimes it is possible to distinguish the enlarged epididymis from the body of the testis. In cases of torsion it is unusual to be able to palpate these two structures separately.

4. *Prehn's Sign*.—Elevation and support of the scrotum for an hour will relieve the pain in epididymo-orchitis, but will not relieve it, or will make it worse, in torsion. This sign is not of great value, as in torsion an immediate operation is indicated.

5. When a secondary hydrocele is present, aspiration of its contents will yield clear serous fluid in epididymo-orchitis, but serosanguineous fluid in torsion.

Another difficulty, but a far less common one, is that when the sac is small, very tense, and situated in the upper part of the inguinal canal, a strangulated inguinal hernia which brings about compression of the veins of the spermatic cord with resultant swelling and tenderness of the testis (Fig. 670) mimics torsion of a completely descended testis.

**Torsion of an Appendage of the Testis.**—The appendage to undergo axial rotation is usually the pedunculated hydatid of Morgagni (*Fig. 671*). Again the signs lead the unwary to diagnose acute epididymo-orchitis. The temperature is slightly elevated, and, as might be expected, other symptoms and signs are milder, although the scrotal oedema, and later redness, is out of proportion to the minute lesion. A reliable rule of thumb is; if the patient is able to walk to seek advice, he has a torsion of an appendage of the testis, whereas in torsion of the spermatic cord, the symptoms are such that the clinician is summoned to the bedside.



*Fig. 670.*—Explanation of how a small strangulated hernia may cause testicular symptoms by pressure on the cord.



*Fig. 671.*—Torsion of the pedunculated hydatid of Morgagni.

### EXAMINATION FOR SUSPECTED VENEREAL DISEASE

Inquire first as to the date of the last sexual exposure. A knowledge of the duration of the incubation period is helpful in the differential diagnosis. It is essential to wear gloves. *In the male* first inspect the external genitalia. An external



*Fig. 672.*—The two-glass test. The patient is instructed to pass some urine into the first glass, the rest into the second. The first specimen shows mucopus and prostatic threads, while the second specimen is clear. Presumptive diagnosis—posterior urethritis.

sore may be obvious, or a dorsal lymphangitis may be discerned—hot and tender in gonorrhoea and chancroid, painless and indolent in syphilis (McLachlan). Next, as the prepuce (if present) is retracted, attention is focused on ascertaining whether a discharge (a frequent presenting symptom) issues from the preputial

sac or from the external urinary meatus. After, if necessary, cleansing the sub-preputial area with cotton-wool moistened with saline solution, the glans penis is inspected carefully for the presence of a sore; then the lips of the meatus are separated, so that a meatal chancre is not overlooked. In all cases in either sex, if a sore or ulcer is present some of the discharge must be examined for a causative organism. The urethra is now milked gently in a downward direction to bring any discharge to the meatus.

**Thomson-Walker's Two-glass Test** will demonstrate if the urethra, generally the posterior urethra, is the seat of infection, for in the first glass there will be turbidity or threads, or both, while in the second glass there will be non-turbid urine without debris (*Fig. 672*). When the bladder is involved in the inflammation, mucopus will be present in both glasses. The presence of prostatic threads, which is excellent evidence of prostatitis, is likely to be shown unmistakably if the test is undertaken after prostatic massage.

*In the female.*—See p. 291. Frequently the patient is not seen until the inguinal lymph-nodes are involved (*see p. 387*).

**Primary (Hunterian) Chancre** usually appears 2–4 weeks after inoculation. Commencing as a papule, in the span of a few days it becomes a painless ulcer, characterized by induration that causes it to feel like a button. Examples of penile chancres are illustrated on pp. 37, 260, and 364. A urethral chancre occurs on the lips of, or just inside, the external urinary meatus. The discharge to which it gives rise is often mistaken for that of a urethritis. Even if untreated a chancre heals in 3–8 weeks leaving a papery thin scar.



*Fig. 673.*—Acute gonococcal urethritis.

**Gonorrhoea.**—The incubation period is from 2 to 10 days. The outstanding symptom is a urethral discharge\*, usually accompanied by burning pain on micturition in the early stage. The urinary meatus is somewhat red and swollen. At the onset the discharge is thin and almost colourless, but after an interval it becomes creamy in consistency (*Fig. 673*) and yellowish-green in colour. If the initial anterior urethritis spreads to the posterior urethra, the pain on micturition becomes severe, increased frequency and urgency of micturition are much in evidence, and the urine is turbid, containing threads and sometimes blood-stained debris. In severe cases painful nocturnal erections, occasionally accompanied by *chordee* (*see p. 362*), complicate the situation.

Chronic gonorrhoea is painless unless symptoms of chronic prostatovesiculitis supervene; in many cases a thin drop of discharge observed at the external urinary meatus on rising, before the patient micturates, is the only sign. This sign, although invariably present, is not pathognomonic of gonorrhoea, for it occurs in other varieties of chronic urethritis, and is spoken of as *gleet*†.

**Non-gonococcal Urethritis** has become much more common with the decline in the incidence of gonorrhoea, resulting from relative control of that disease by antibiotics. The discharge is more watery than that of gonorrhoea, and it contains

\* In passive male homosexuals a rectal discharge may be the only clinical finding.

† *Gleet*. Old French, *glete* = litharge; oxide of lead.



much mucus. These characteristics help to differentiate the two conditions, but non-response to antibiotics remains an indirect sign.

**Reiter's Disease** (*see p. 449*).

**Chancroid** (due to infection with *Haemophilus ducreyi*) appears 2–3 days after inoculation, and is characterized by a painful non-indurated ulcer which becomes somewhat irregular in outline. It is common in the tropics. As a rule the ulcer, which is extremely tender, becomes duplicated or



Fig. 674.—Chancroid (soft sore) with suppurating left-sided inguinal nodes (bubo).



Fig. 675.—Lymphogranuloma inguinale.

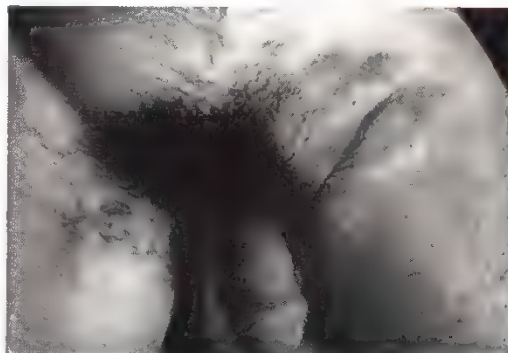


Fig. 676.—The sign of the groove.

multiple (Fig. 674) by auto-inoculation. The complete absence of induration led to the term 'soft sore'. When situated beneath the prepuce, very often it causes the prepuce to become oedematous, and sometimes a foreskin, formerly retractable, becomes irretractable. In such cases ulcerative destruction is wont to proceed apace, and to become secondarily infected (phagedena\*).

**Lymphogranuloma Venereum (Inguinale)** (Tropical Bubo) is a virus-borne venereal disease that in white people sometimes causes considerable constitutional symptoms. The disease, as its synonym implies, is rife in tropical and sub-tropical climes; it is also much in evidence in the Southern States of the U.S.A. It is by no means a rarity among European seafarers, and in recent years (due to an influx of West Indian immigrants) has become a condition that no clinician in the great cities of the British Isles can afford to disregard. The incubation period is from 1 to 4 weeks. The

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\* *Phagedena*. Greek, φαγεῖν = to eat.

primary lesion on the glans penis, or in the vagina, or on the cervix is rather like herpes, and of fleeting duration. The diagnosis must be confirmed by special skin or blood tests.

**Granuloma Inguinale** (Granuloma Venereum).—Do not confuse *granuloma* inguinale with *lymphogranuloma* inguinale. Although, like lymphogranuloma inguinale, granuloma inguinale is a venereal disease, endemic in warm climates, that can be brought by natives of those countries and transmitted to inhabitants of temperate climates, it is an entirely different infection, due to a bacillus, the *Donovania granulomatis*, demonstrable in the lesion which affects predominantly the inguinal, genital, perineal, and peri-anal regions. The incubation period is from three to thirty days. Commencing as a vesicle, it soon develops into an ulcer (Fig. 677) or a mass of exuberant granulation tissue. Pain and tenderness are singularly absent unless secondary infection occurs. The lesion progresses slowly by peripheral extension, and also by satellites due to auto-infection. It should be noted particularly that, although the inguinal region is often involved, the inguinal lymph-nodes are not implicated until late, and then only if secondary infection supervenes.



Fig. 677.—Granuloma inguinale.

**Examination of the Regional Lymph-nodes.**—In either sex the significant findings are:—

*In syphilis* the inguinal lymph-nodes become palpable three to five days after the appearance of the chancre—that is, rather later than in other venereal diseases in which these nodes become involved. The enlargement, like most syphilitic manifestations, is unobtrusive; the nodes are painless, non-tender, elastic, and (in the absence of secondary infection) freely movable under the skin. The whole group of nodes from the saphenous opening upward, and those along the inferior border of the inguinal ligament, are usually involved and the adenopathy is usually bilateral and symmetrical.

*In gonorrhoea* the nodes on both sides are moderately enlarged and slightly tender.

*In non-gonococcal urethritis*, as in all abacterial infections, lymphadenitis is frequently absent, but should pyogenic bacterial infection become superadded, inguinal adenitis is likely to supervene.

*In chancroid* considerable tender enlargement of the inguinal lymph-nodes occurs early and frequently suppuration follows (see Fig. 674). Constitutional symptoms are more pronounced than with the lymphadenitis of other venereal diseases.

*In lymphogranuloma inguinale* a lymph-node enlarges in one groin, or, in a quarter of cases, in both groins (Fig. 675). The infection spreads to other nodes, and often the external iliac group becomes involved. In this event the fold of the groin is not obliterated and a sulcus separates the supra-inguinale from the infra-inguinale lymph-nodes—the sign of the groove (Fig. 676). Soon periadenitis occurs, the mass increases in size, and the overlying skin (in white races) becomes purple. Untreated, the lymphadenopathy proceeds to liquefy, and the mass breaks down and discharges thick white pus. The resulting sinus persists for months or years.



## CHAPTER XXVI

## THE CIRCULATION IN THE EXTREMITIES

## THE ARTERIES

**Atherosclerosis** is a degenerative condition affecting chiefly the large and medium-sized arteries. The pathological process, 'atheroma'\*, is confined to the *intima*. The abdominal aorta and the iliac and femoral arteries are the common sites, with occasionally the tibial vessels involved. The upper extremities nearly always escape severe involvement. There are no physical signs of this disease. Its presence can be surmised only by its chief complication—arterial thrombosis, i.e., complete blockage.

**Arteriosclerosis.**—With advancing age calcification of the *media* always occurs. 'As old as his arteries' is an everyday expression. The arteries feel hard, and can be visualized readily in a soft-tissue radiograph. Clinically, the state of the temporal artery is often a guide to the presence of this common development, but the radial, brachial, and femoral arteries should also be palpated. Arteriosclerosis by itself does not cause arterial blockage, but atherosclerosis often coexists.

**Intermittent Claudication.**†—No condition other than arterial insufficiency produces *on walking* the phenomenon of (a) pain in the leg (especially in the calf but sometimes in the thigh or buttock or instep) increasing steadily until the patient is compelled to stop; (b) relief of that pain by rest. Should he resume his journey on foot, this sequence is repeated, and he is compelled again to halt at exactly the same distance (*claudication distance*) as before. Thus he progresses in stages to his journey's end, or until he decides on an alternative method of transportation. Almost invariably intermittent claudication is caused by blockage of a segment of a main artery. The collateral circulation provides enough blood for the relevant muscles at rest, but not during activity. An atheromatous plaque is the most common precursor of the causative arterial thrombosis; consequently the arteries need not necessarily feel 'pipe-stemmed', or even thickened.

Nearly all patients with intermittent claudication have impalpable pulses below the femoral on the affected side or sides.

**Rest Pain** in obliterative vascular disease of the lower extremity is of much graver significance than intermittent claudication; gangrene is never far away. Usually the pain is felt in the foot and is worse at night when the foot becomes warm beneath the bedclothes. The patient endeavours to seek relief by hanging the leg or legs out of the side of the bed. Standing on a cold floor is another expedient. So insufferable does the pain become that not infrequently the patient elects to sleep in a chair. In cases of rest pain due to obliterative vascular disease, trophic ulcer (*see p. 422*) of the ischaemic foot is a frequent precursor of gangrene.

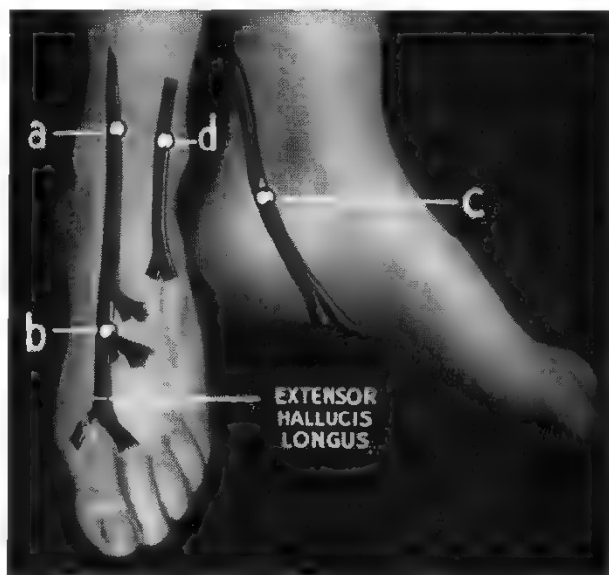
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\* *Atheroma*. Greek, *ἀθήρη* = porridge + *ωμα* = tumour. The fatty degeneration resembles porridge in appearance.

† *Claudication*. Latin, *claudicare* = to limp.

**Feeling the Pulses of the Lower Extremities.**—A knowledge of how to feel the pulses is an indispensable accomplishment not only in cases of intermittent claudication and rest pain, but in suspected arterial disease and in threatened or established gangrene of a toe or toes. The student is advised to practise feeling the pedal pulses (*Fig. 678*) in normal persons: sooner or later the practice gained thereby will stand him in good stead. When in doubt whether a pulse in the distal part

*Fig. 678.*—Points for seeking the pulsation of (a) the anterior tibial; (b) the dorsalis pedis; (c) the posterior tibial; and (d) the peroneal arteries.



of the lower extremity is really being felt, or whether it is the examiner's own arterial beat being appreciated by the finger pulp, simultaneously palpate the patient's radial pulse; if the latter synchronizes with the doubtful pulse, it must be the patient's.

*The Dorsalis Pedis Artery.*—The toes are grasped lightly in the left hand so as to steady the foot. The fingers of the right hand are slid along the groove between the first and second metatarsal bones, upwards towards the ankle, the pulps of the fingers being directed slightly towards the first metatarsal bone. Usually the pulse is felt just lateral to the tendon of the extensor hallucis longus at the proximal end of the groove (*Fig. 679*). In 10 per cent of persons the artery is congenitally absent from its usual position, and therefore lack of its pulsation is valueless unless corroborated by other signs of obliterative arterial disease.

*The Posterior Tibial Artery* is accessible about halfway between the back of the medial malleolus and the medial border of the tendo Achillis, especially when the foot is dorsiflexed and inverted (*Fig. 680*). Sometimes it is difficult to feel, and absolute reliance cannot be placed upon the absence of its pulsation.

When neither of these pulses can be discerned, arterial pulsation should be sought in the region of the ankle-joint, namely:—

*The Anterior Tibial Artery* becomes superficial just above the level of the ankle-joint, and it can be felt midway between the two malleoli (*see Fig. 678*).

*The Peroneal Artery* replaces the anterior tibial artery in 5 per cent of cases (Cohen). It should be sought 1 cm. medial to the lateral malleolus (*see Fig. 678*).

**Intermittent Claudication with Foot Pulses present.**—The history is strongly suggestive, but to one's surprise the dorsalis pedis and posterior tibial pulses (or one of these) are easily felt. Ask the patient to exercise by walking or running sufficiently to bring on the pain. Prompt re-examination

## FEELING THE PULSES OF THE LOWER EXTREMITY



Fig. 679.—Feeling the dorsalis pedis pulse.



Fig. 680.—Palpating the posterior tibial pulse behind the medial malleolus.



Fig. 681.—Palpating the popliteal pulse: Method I. (See Fig. 894, p. 531, for Method II.)



Fig. 682.—Feeling the femoral pulse.

will show that the foot pulses have disappeared if the pain is truly that of intermittent claudication (De Weese). The explanation is that a major artery is partially or completely blocked but there is a good enough collateral circulation for pulsations to reach the foot. Exercise increases the oxygen requirements of the muscles sufficiently to by-pass the blood reaching the foot arteries, the pulsations of which become impalpable.

*The Popliteal Artery*, which lies deeply in the midline, can be sought by flexing the knee to a right-angle and palpating very deeply (Fig. 681). Commence somewhat medially and bring the finger-tips transversely across the line of the artery. Should it not be possible to locate the artery in this way (and in fat persons its identification is difficult) the prone position, with the knee flexed, is used to palpate the space (see Fig. 894, p. 531). In cases where it is necessary for the patient to turn face downwards, it is convenient to palpate the femoral artery before making a renewed search for the popliteal artery.

*The Crossed Leg Test for Popliteal Pulsation* (Fuchsig).—This test, and for that matter routine palpation of the popliteal artery, is unnecessary if one or more foot pulses are present, for the latter could not be felt if the popliteal artery were blocked. It is performed with the patient seated (Fig. 683). When a person sits with the legs crossed oscillatory movements of the foot occur synchronously with the pulse if the popliteal artery is patent. It is important to continue to take the history or otherwise interest the patient in order that his attention is distracted from the legs. While so doing carefully observe the foot for oscillations.

*The Femoral Artery* is not always easy to feel in a well-covered individual. Palpate rather deeply (Fig. 682) below the inguinal ligament, midway between the

anterior superior iliac spine and the symphysis pubis. Absence of this pulse indicates that the external or common iliac artery is occluded; if both pulses are impalpable it suggests that the abdominal aorta is occluded.

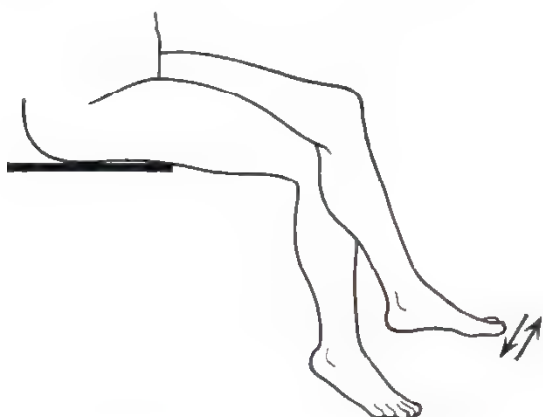


Fig. 683.—Movements of the foot of the crossed leg when the popliteal artery is patent.

**Buerger's Postural Test** is an easily performed, practical clinical test applicable to *any variety* of fairly advanced occlusive arterial disease of the lower extremities, not, as is sometimes thought, peculiar to sufferers from Buerger's disease. It should be carried out in broad daylight. The patient lies on his back, and lifts

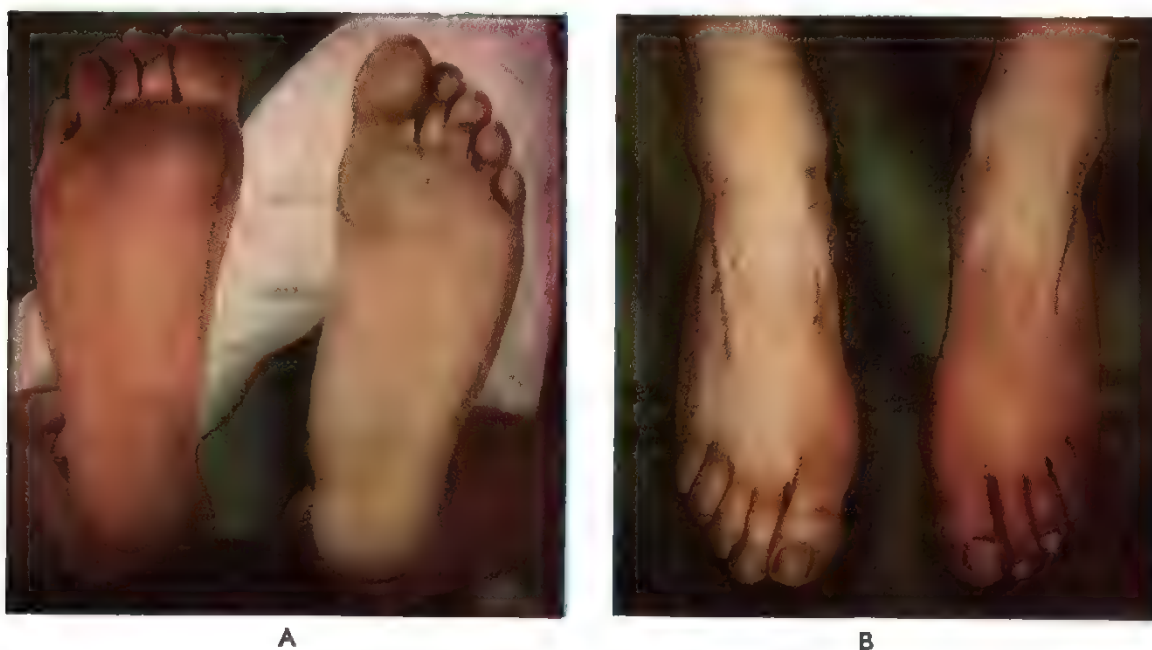


Fig. 684.—Buerger's postural test. **A**, Pallor of the involved foot in the elevated position; **B**, Cyanosis of the same foot in the dependent position.

both legs high, keeping the knees straight. The legs are supported by the examiner, while the patient flexes and extends his ankles and toes to the point of mild fatigue. When there is a defective arterial blood-supply to the limb, the sole of the foot assumes a cadaveric pallor and prominent veins on the dorsum of the foot become empty and 'guttered'. The feet are lowered, and the patient adopts a sitting posture. In two or three minutes a ruddy, cyanotic hue spreads over the affected foot (Fig. 684). This sequence signifies that a major lower-limb artery is occluded.



### SPECIAL VARIETIES OF PERIPHERAL OCCLUSIVE VASCULAR DISEASE— EARLY SIGNS

**Thrombo-angiitis Obliterans** (Buerger's Disease) is of such rarity that some observers doubt its existence as an entity separate from atherosclerosis. However, Szilagy encountered 22 undoubted cases in 1400 examples of peripheral vascular disease (1.5 per cent). Also, it is relatively common in Japan (Ishikawa) where it composes a third of cases of arterial disease. It gives rise to symptoms before the age of 30 and is peculiar to men; in women it is virtually unknown. The patient is always a very heavy smoker and the inevitable progress can be halted only by the cessation of smoking—almost a therapeutic test.

**Arteries.**—As a rule, signs of arterial insufficiency appear first in the lower extremities, but sooner or later the arms suffer also. Intermittent claudication in the feet, and similar cramp-like pains in the hands, is often a leading symptom. In some cases the examiner will notice coldness and colour changes in both upper extremities. The distal pulses are diminished or absent, although the arteries (as judged by more proximal pulses) remain soft. Usually the episodic nature of the disease allows an adequate collateral circulation to develop in response to each successive block, but in some instances it strikes with appalling rapidity, and all four limbs may be lost in a short time.

**Veins.**—Superficial migratory thrombophlebitis, often commencing in the veins of the feet and frequently associated with fungus infection of the interdigital clefts, occurs in the majority and may precede or accompany the arterial manifestations of the disease.



Fig. 685.—Raynaud's disease: spasm induced by the patient dipping her hands in ice-cold water.

**Acrocyanosis** (Hereditary Cold Extremities) is a common complaint of varying severity, commencing in youth, due to intermittent spasm of the small peripheral arteries initiated by cold. There is *persistent* cyanotic discoloration of the hands when exposed to cold. Often the palms of the hands are moist at a comfortable room temperature. It usually occurs in women but is not as rare in men as is the following condition. The feet are similarly affected usually, which, together with its mildness and non-progressive nature, serves to differentiate it from Raynaud's disease.

**Raynaud's Disease** is comparatively rare. It occurs mainly in women, and commences between the ages of 25 and 45 years as a unilateral affection; in its earliest stages it is indistinguishable from acrocyanosis. In a matter of a few months the attacks become more frequent, bilateral, and last longer. Often the tip of one or more fingers remains numb and cold long after the rest of the digits have regained an adequate circulation. Rarely is the thumb affected.

To diagnose Raynaud's disease the typical spasms, of which there are three phases, must be observed. In the first the digits become paroxysmally ashen white; in the second, blue, and in the last reddened with painful reactive hyperaemia. One may not be present when arteriospasm is in progress; ask the patient to put one

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MAURICE RAYNAUD, 1834-1881, *Physician, Hôpital Lariboisière, Paris.*



hand (the comparatively normal one) into cold water. This may initiate an attack (*Fig. 685*).

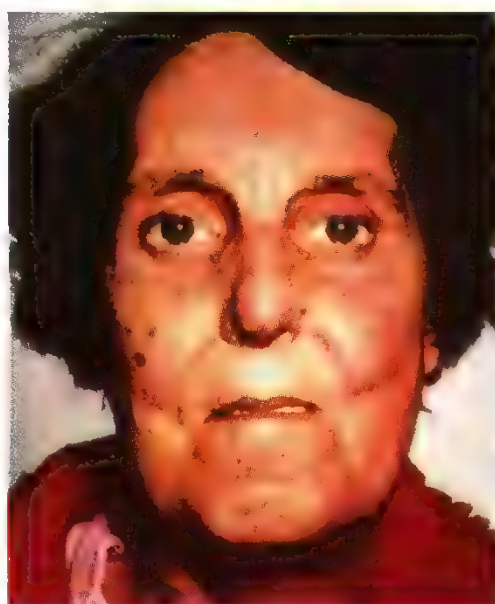
As the disease progresses atrophy of the terminal pulp compartment of the finger or fingers most affected occurs. This gives the finger or fingers a tapering effect, viz. ———→ The nails are often ridged and brittle and paronychia is common. In advanced cases small areas of superficial necrosis, sometimes preceded by cutaneous calcification, are wont to occur on the finger-tips; these are excruciatingly painful. Occasionally gangrene involves a more substantial portion of a finger.



In cases of many years' standing, other signs should be sought: (a) scleroderma—the skin of the hands (*Fig. 686*), especially of the fingers, and of the face (*Fig. 687*), becomes atrophic; similar changes in the oesophagus cause dysphagia: (b) telangiectases occurring over the face, hands, and forearms (Verel).



*Fig. 686.* The hand in long-standing scleroderma.



*Fig. 687.*—Mask-like facies in scleroderma. The atrophic skin becomes bound down particularly over the bones of the nose and cheek.

**Raynaud's Phenomenon in Men.**—(a) Vibrating tools, notably pneumatic drills, pneumatic hammers, and certain tools used in the shoe trade cause a condition not differing materially from that described already. The attacks come on only in the man's leisure hours. In the patient who has used a pneumatic hammer, usually the left hand is the first to become implicated, the index finger being most affected. In half the cases the condition remains entirely unilateral and, when well-established, attacks in bed at night are a noteworthy feature. Rarely does the condition progress to a stage of cramps, pain, trophic changes, or gangrene, but even when diagnosed early and the patient is forbidden to use vibrating tools, symptoms recur for years.

(b) Digital Atherosclerosis (*see p. 388*) is the usual cause when vibrating tools are not implicated.

(c) Buerger's Disease (*see p. 392*).

**Erythromelalgia** (Erythralgia) may be *primary* (aetiology unknown and very rare) or *secondary*. It is characterized by attacks of severe burning pain and rubor (which must be distinguished from the rubor of ischaemia, *see Fig. 684*) in the *feet*, seldom in the hands. So great is the sensation of heat that the patient puts the feet out of bed or immerses them in cold water. Seen during an attack, the feet are flushed, the veins prominent, the skin temperature slightly raised, and the

surface of the skin is so hyperaesthetic that the slightest touch is resented. The secondary type is not uncommon in obliterative vascular disease when sepsis is present, is seen with erythrocyanosis frigida (*see* p. 392), polycythaemia, gout, and also after frost-bite.

### PERIPHERAL ARTERIAL THROMBOSIS

Arterial thrombosis is a common complication of atherosclerosis (*see* p. 388). Ordinarily a slow process, it can occur in an acute form (*see* p. 395).

**Chronic Thrombosis of the Femoral or the Popliteal Artery.**—The leading symptom is intermittent claudication. The popliteal and foot pulses are not palpable. Buerger's test (*see* p. 391) may be positive. Wasting of the calf muscles is often evident. The thrombosis slowly extends downwards into the smaller distal vessels over a period of months and years and ultimately the collateral circulation is insufficient to prevent gangrene, at first of the toes, later extending up the foot.

**Chronic Thrombosis of the Smaller Arteries of the Leg.**—The popliteal pulse remains palpable, but the pulses at the ankle are absent. As one would expect, the signs are confined to the foot. There is intermittent claudication with pain in the instep, constant bluish-red discoloration and coldness of the toes, extending for a variable distance on to the foot; in many instances ulceration or gangrene of a portion of the discoloured area follows. Some of the patients in this group have claudication in the calf, which in the presence of a popliteal pulse must be attributed to obstruction to the muscular branches of the main vessel.



Fig. 688.—The extent of gangrene in a patient with arteriographically proved thrombosis of the brachial artery.

**Thrombosis of the Bifurcation of the Aorta (Leriche's Syndrome).**—Thrombosis always starts in an iliac artery and is generally observed in an individual in the prime of life. It is progressive, ultimately producing a complete bilateral occlusion of the iliac arteries and lower part of the abdominal aorta up to the renal arteries. Intermittent claudication, mainly in the thigh or buttock, develops in one or both lower limbs. Patients suffering from early aortic or iliac arterial occlusion with pain situated in the buttocks due to diminished blood-supply of the sciatic nerve are frequently referred to the orthopaedic department with a diagnosis of 'sciatica'. There is easily appreciated coldness in one limb, and later in both limbs. Wasting of the buttocks and the muscles of one, and later the other, leg occurs in half the cases. In the male there is always diminishing, and later complete disappearance of, penile erection. Undoubtedly the most important sign is loss of pulsation of the femoral artery, first on one side and then on the other. In thin subjects vigorous pulsation can be felt in the abdominal aorta above the block.

**Thrombosis of a Major Artery of the Upper Extremity** is uncommon. As a rule the collateral circulation is sufficient to spare the limb although pain on working with the arm, the equivalent of intermittent claudication, may result; exceptionally, limited gangrene of the finger-tips follows (*Fig. 688*).

Rob reported thrombosis of the axillary artery following the use of an axillary crutch for many years. A number of cases have also occurred in patients with chronic bronchitis, probably as a result of contusion of the subclavian artery over the first rib during a severe bout of coughing (Rose).

**The Pulseless Disease of Takayashu.**—No pulse can be felt in one or both arms or the corresponding side or sides of the neck and temples due to progressive occlusive vascular disease of the arterial trunks arising from the aortic arch. It occurs chiefly in young women in the Far East, and

RENÉ LERICHE, 1879–1956, *Professor of Medicine at the Collège de France, Paris—the highest professional honour in France.*

CHARLES G. ROB, *Contemporary Professor of Surgery, Rochester University, New York.*

SIDNEY S. ROSE, *Contemporary Surgeon, University Hospital of South Manchester.*

MIKITO TAKAYASHU, 1860–1938, *Professor of Ophthalmology, Medical College, Kanazawa, Japan.*

because of its slow development (which gives every opportunity for a collateral circulation to open up) it remains unnoticed for some time. It is characterized by attacks of fainting on turning the head suddenly, or on arising from the supine to a sitting posture, atrophy of the face, headaches, cataracts, optic nerve atrophy without papilloedema (due to occlusion of the carotid arteries), and weakness and paraesthesia of the upper extremities (due to occlusion of the brachial arteries). Cerebral softening and death from hemiplegia or convulsions is the usual termination.

**Arterial Obstruction in the Neck.**—See p. 149.

#### SUDDEN OCCLUSION OF A MAJOR PERIPHERAL ARTERY

Sudden occlusion of a major peripheral artery can be due to (a) acute arterial thrombosis, (b) arterial embolus, (c) trauma.

**Acute Arterial Thrombosis.**—The most common site is the lower end of the femoral artery, where the artery leaves the subsartorial canal to enter the popliteal space. *At this site acute thrombosis is more frequent than peripheral embolism.* Each produces acute ischaemia with signs so similar that occasionally a differential diagnosis is impossible. When faced with this problem a golden rule is—*the absence of a cardiac lesion is strong evidence in favour of primary thrombosis.*

Commonly, acute thrombosis arises in an artery considerably narrowed by arterial disease. In this event the collateral circulation is established already, and the extent of the ischaemia is limited correspondingly. Moreover, in these cases of acute-on-chronic arterial thrombosis *the patient will almost certainly give a history of intermittent claudication.*

**Peripheral Arterial Embolism.**—The past history and an examination of the heart are of overriding importance. In half of the cases of peripheral embolism the patient suffers from auricular fibrillation. Most of the remainder have suffered recently from cardiac infarction. The origin of the embolus is the clot in the left auricle or ventricle or, in a small minority, detachment from an atheromatous plaque in the aorta.

*Shock* is singularly absent (cf. Phlegmasia Cerulea Dolens, p. 401).

*Pain* in the limb is the initial symptom in 95 per cent of cases. Numbness and weakness is present also, and in 5 per cent it precedes the pain. Classically, the pain is abrupt and excruciating, but in 30 per cent it comes on more gradually.

*Colour Changes* are limited to the more distal part of the limb, the ischaemic portion of which assumes a cadaveric pallor, described as waxy. An hour or more later the area becomes cyanosed distally, and mottled more proximally. Raising the limb decreases the cyanosis and 'gutters' any prominent vein.

*Pulses* are absent distal to the impaction.

*Local Temperature.*—It is not long before the ischaemic area of the affected limb becomes appreciably colder than that of the opposite side.

*Other Signs.*—Calf tenderness or pain on dorsiflexion of the foot (see p. 399) is often present in an otherwise anaesthetic limb. Soon after the occlusion the involved muscle is flaccid, but within a few hours it becomes turgid. About this time the foot assumes the position of plantar flexion, shown in Fig. 689.

*Site of Impaction.*—As a rule, the embolus becomes arrested in the lower half of the body at or just below the site of bifurcation of a major artery (Fig. 690). More rarely the embolus lodges in an artery of the upper extremity.

It is not usually difficult to ascertain where the embolus has lodged. The best guide is the absence of pulses below the embolus and the level of coldness. Thus lowered skin temperature is usually found as follows:—

- Aortic bifurcation embolism—both limbs below the groins.
- Common iliac embolism—one limb below the groin.
- Common femoral embolism—below the knee.
- Popliteal embolism—the foot.

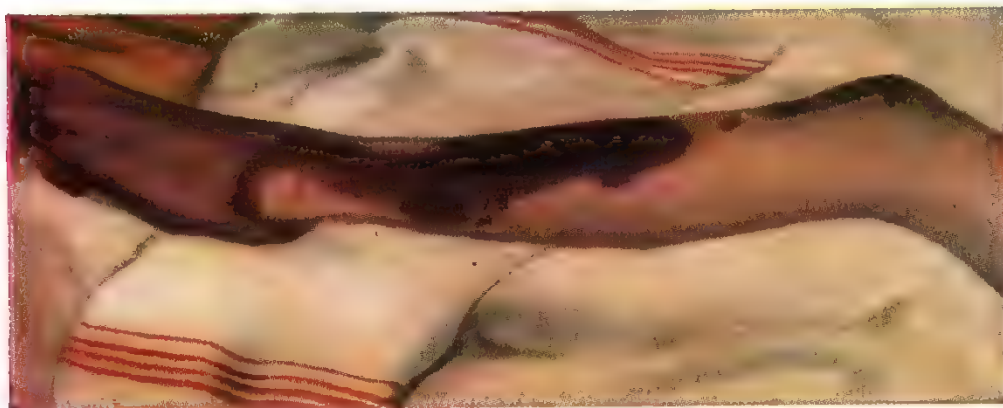


Fig. 689.—Too late to save the limb! An embolus became lodged in the common femoral artery 48 hours before the patient's admission to hospital. The patient is a young woman with mitral stenosis.

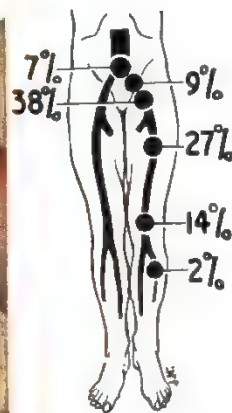


Fig. 690.—Sites and frequency of impaction of emboli in the lower limb.

**The Auscultation Test.**—Temporarily occlude the femoral (or brachial) artery at the root of the limb with the pressure of a sphygmomanometer cuff. A stethoscope is applied at various points along the course of the artery, from above downwards. After the pressure is released the booming of the returning arterial flow (as in taking the blood-pressure) will be heard until the site of the embolus is reached, when there is an abrupt cessation of sound (Last).

**Arterial Trauma.**—Arterial insufficiency following a closed injury of an extremity may be due to several conditions:—

1. Injury to a major artery by a bone fragment.
2. Pressure on a major artery by an angulated bone-end.

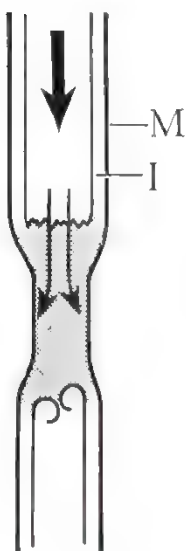


Fig. 691. The explanation of so-called 'traumatic arterial spasm'. The media (M) remains intact but the intima (I) ruptures. In effect the artery has been transected as there is no flow through the narrowed segment. Between the intimal ends clot may collect.

3. Intimal rupture of a major artery due to a fracture or dislocation (Fig. 691).

4. Occlusion of the artery by a haematoma enlarging beneath the unyielding deep fascia. In haemophilia relatively minor trauma may cause this.

These complicate, notably, the following fractures and dislocations (approximate order of frequency):—

- Supracondylar (including displaced epiphysis in children) or shaft of humerus.
- Dislocated shoulder.
- Supracondylar (including displaced epiphysis) or shaft of femur.
- Dislocated elbow.
- Dislocated knee.



Examine carefully for loss of pulsations and coldness of the extremities, particularly with the above injuries. *See also* Volkmann's *Ischaemia*, p. 491.

In young patients with hemiplegia after trauma be on the look-out for arterial thrombosis consequent on intimal rupture as a result of direct trauma to the internal carotid artery by sudden hyperextension and lateral flexion of the neck. Arteriography is necessary to confirm that the cause is not an ordinary stroke (Rowbotham).

#### GANGRENE OF THE EXTREMITIES

**Gangrene Threatened.**—In the comparatively early painful stage the ischaemic foot (or finger) is nearly always pink, the skin being atrophic as though it were stretched tightly over underlying structures (Oakley).

**Local Temperature.**—The skin feels cooler than on the normal side.

**Pulses.**—The pulses of the affected foot are usually absent.

**Hair on the Digits as a Guide to the Severity of Ischaemia.**—Most normal persons have hair on their toes. The hairs of the toes are shorter and fewer in women than in men, and there is a sharp reduction in number after the age of 50 years. Patients with peripheral arterial occlusion with severe ischaemia have fewer hairs on the toes on the more affected side. This sign is only of value if the blood-supply of the opposite foot is good.

**Established Gangrene.**—A patient with gangrene of a portion of an extremity (*Fig. 692*) is presented. We wish to know the probable cause, and to ascertain the condition of the circulation above the gangrenous area. Inspect the limb. Note particularly the area between the living and dead tissue. Decide if the process is infected or 'dry'.

Lay the hand upon the surface of the skin above the gangrenous area and observe whether it is colder than it should be.

Most cases of gangrene are due to atherosclerosis often associated with diabetes. Therefore proceed at once to test the urine for sugar. Also observe the toes for the typical deformity associated with diabetic neuropathy (*see Fig. 728*, p. 422).

**The Diabetic Foot.**—It is often difficult to decide whether a foot lesion in a diabetic is due to ischaemia, neuropathy or both. Eastcott notes that *painful* necrosis in a cold pale foot is due to ischaemia; *painless* necrosis at a pressure area is due to neuropathy. With either, superadded infection may cause a warm pink foot.

Having palpated the arteries of the upper extremity, return to the affected limb and palpate its arteries (*see p. 389*) and compare with the opposite side.

If the clinician is puzzled as to the cause of the local death, it is profitable to ask oneself a few questions:—

*Is it Frost-bite?* (*Fig. 693*). On one occasion during summer a case of gangrene of two fingers presented in a man who described himself as a meat porter. A further inquiry brought to light the fact that he spent his working days in a refrigerator!



*Fig. 692.*—Atherosclerotic gangrene showing a well-defined line of demarcation.



*Is it Carbolic Acid Gangrene?* Even a weak solution of carbolic acid, after it has remained in contact with the skin for some days, can cause gangrene. Should the affected integument be dead-white (Fig. 694), crinkled, and insensitive to touch, inquire whether this chemical or one of its derivatives has been used as a dressing. Examine the urine in a good light. In carbolic acid poisoning it is often smoky or dark brown (see Fig. 750 A, p. 439).



Fig. 693.—Gangrene developing after frost-bite in a Kentish farm labourer during a severe frost.



Fig. 694.—Carbolic acid gangrene. The result of applying a dressing moistened with a phenol derivative.

*Is it Thrombo-angiitis Obliterans?* (See p. 392.) The gangrene is usually moist.  
*Is it Raynaud's Disease?* (See p. 392.)

**Gas Gangrene.**—In civil life this is comparatively rare. Usually it is a complication of a compound fracture, but is not infrequent after surgical removal of gangrenous bowel in a hernial sac (White) and after septic abortions and delivery. Clostridial organisms rarely become pathogenic unless they enter previously damaged tissues.

*Early Diagnosis.*—Pain is frequently the first indication of something amiss. An anxious look and a rising pulse (out of proportion to the temperature) increase the suspicion and call for inspection of the wound. The characteristic odour has been described on p. 41. Examination of the wound shows a surrounding area of red, brawny swelling. Gas gangrene spreads along the muscle planes. Crepitus is sought in the manner described on p. 16, both above and below the wound; sometimes it is elicited some distance away, but unless it is abetted by other signs of clostridial infection, this is insufficient evidence of gas gangrene—the alarm that crepitus due to air entrapment in the tissues sometimes occasions has already been referred to on p. 252.

The most frequent sites for this infection are the adductor region of the lower limb and the buttocks. In the upper limb the subscapular region is the most common site.

*Later General Signs* that suggest possible clostridial septicaemia include an alert sensorium with irritability, dyspnoea, and tachycardia out of proportion to the pyrexia.

## THE VEINS

### VENOUS THROMBOSIS

**Thrombophlebitis** can be superficial or deep. 'Silent' deep thrombophlebitis constitutes one of the most important diagnostic problems of the day, the paramount importance of which lies in early detection, the better to avoid the dreaded sequence, deep thrombophlebitis → pulmonary embolism. In spite of such measures as 'early

rising' in the postoperative period and the control of infections by antibiotics, postoperative thrombophlebitis shows no evidence of decline—rather the contrary. Possibly this is due to the increasing age and infirmity of patients deemed fit for surgical procedures.

**Thrombophlebitis Decubiti.**—Undoubtedly the early detection of clotting in the deep veins of the leg is proportional to the diligence of the search. Ideally, every patient mainly or entirely confined to bed, i.e., medical cases, and all those who have undergone an operation within the past two weeks, deserve a routine daily examination of the legs for evidence of deep thrombophlebitis. Except in particularly well-staffed institutions, this is a counsel of perfection. It is therefore most desirable to know which patients are most likely to suffer this complication. The answer is: those more than 40 years of age; obese patients; those with otherwise unexplained pyrexia; those with organic heart disease; and those who have undergone an abdominal operation, particularly prostatectomy or cholecystectomy, nailing of fractured neck of the femur, and also, curiously, patients who have undergone an operation for cataract.

Fig. 695.—Dorsiflexion of the foot to ascertain if this causes pain in the calf.



Before commencing a routine search for the discovery of 'silent' deep thrombophlebitis remember that dislodgement of clot by rough manipulation is an ever-present danger. Therefore be gentle, and do not hurry. The degree of pressure necessary to elicit the tenderness of deep thrombophlebitis is not great.

Have the bedclothes turned up (not down) to display the whole of both extremities.

1. *Observe the Limbs:* (a) for inequality of girth (which is unlikely to be present in early cases); (b) pay particular attention to the relative prominence of the veins of the dorsum of the foot and look for visible (not varicose) veins coursing over the upper third of the tibia on the affected side, useful signs of thrombosis of the popliteal vein (Pratt).

2. *Palpate the Instep*, and follow this up by finger-stroking around the sulcus beneath the medial malleolus and by testing the ankle for pitting oedema.

3. *Dorsiflex the Foot* (Fig. 695).—This exerts slight traction on the posterior tibial vein, which, if involved, causes pain in the calf (Homans's sign). In women accustomed to wearing high-heeled shoes, with in consequence a short tendo Achillis, a false positive result is not unusual.

4. *Examine the Calves.*—Request the patient to draw up the knee and lie quietly, keeping the leg in that position. Commencing near the tendo Achillis

(Fig. 696) grasp the calf, and while retracting it from the tibia, squeeze it gently. Proceed in this way in an upward direction until the main muscle belly is reached (Fig. 697). The endeavour is to ascertain whether the soleus is tender, for carefully performed necropsies on patients who have been in bed for more than a week before death show a high incidence of thrombosis of the veins of the soleus muscle (Gibbs). Next alter the grip on the calf, so as to be able to compress the main muscle belly forwards. Tenderness elicited in this way suggests strongly thrombophlebitis of the posterior tibial vein. Comparative palpation of the bellies of both calf muscles is valuable.



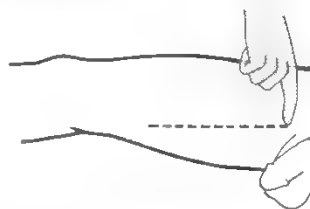
Fig. 696.—Seeking tenderness of the calf muscles, beginning near the tendo Achillis.



Fig. 697.—Method of ascertaining tenderness or fullness of the soleus muscle.

5. *Palpate the Popliteal Space* for tenderness. Now ask the patient to let down his legs, so that they rest on the bed comfortably.

6. *Seeking Tenderness in the Thigh.*—Place the tip of the index finger over the saphenous opening (for surface marking, see Fig. 501, p. 270) and draw the finger —————> downwards along the course of the femoral (not the long saphenous) vein.



7. *Ascertaining the Presence of Very Early Oedema.*—

Pinch up a small portion of skin. In very early oedema there is a resistance that is not present on the normal side, owing to thickening of the dermis and subcutaneous tissues (Rose).

8. *Comparative Mensuration.* Lastly, if there is any question that one leg is swollen, comparative measurements at identical points on the calf and thigh (see p. 505) will settle the question.

**Phlegmasia Alba Dolens\*** (White Leg; Milk Leg) results from iliofemoral thrombophlebitis. Very seldom it occurs spontaneously; nearly always it arises after immobilization in bed following an operation or childbirth. There is also an appreciable incidence among patients confined to bed with medical as opposed to surgical illnesses. Obstetricians have reported cases occurring during late pregnancy, as opposed to the puerperium.

The thrombophlebitis often commences in the veins of the soleus muscles, and the thrombosis proceeds in an upward direction. Many cases seem to arise without those premonitory signs

\* *Phlegmasia alba dolens*—painful white leg; *Phlegmasia cerulea dolens*—painful blue leg. (Literally, painful white/blue inflammation.)

referred to in the section on Thrombophlebitis Decubiti, and in these clotting commencing at a valve of the femoral vein or in the pelvic veins is the cause.

The march of events is as follows: The patient experiences vague general malaise. Twenty-four hours later an otherwise unexplained rise of temperature occurs. Pain is felt in the groin and in the medial aspect of the thigh. In a few instances the pain, which varies in severity, is located farther down the leg. During



Fig. 698.—Phlegmasia alba dolens in a patient aged 63 years, who had been confined to bed with acute colonic diverticulitis.



Fig. 699.—Venous gangrene; note the massive swelling of the limb.

the succeeding 12 hours swelling of the limb appears, but the swelling commences below the knee and spreads to the thigh (Fig. 698). Anteriorly it ceases abruptly at the inguinal fold; posteriorly it involves a variable portion of the buttock. It is due to oedema, and pits on pressure. The limb is pale in contradistinction to the condition described below. There is tenderness along the course of the femoral vein and often deep tenderness in the corresponding iliac fossa. The foot feels colder than its fellow. Enlargement of the ipsilateral regional lymph-nodes of the groin is not unusual. The acute phase of this variety of thrombophlebitis lasts 2–6 weeks if untreated. Post-mortem examination of fatal cases of pulmonary embolism arising with this condition often show that the embolus arose from the clinically silent side so that the *opposite* leg should be examined carefully for signs of thrombophlebitis.

The acute phase is followed by the chronic phase, which is characterized by a swollen, oedematous limb requiring elastic stocking support, coldness and aching in the limb (venous claudication), and, in a small percentage of cases, the development of a venous ulcer (*see* p. 539).

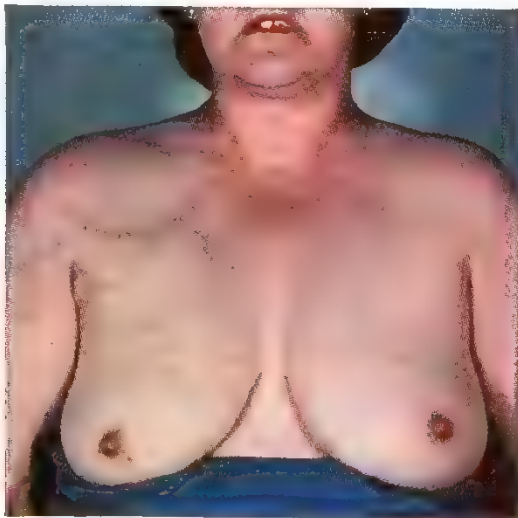
**Phlegmasia Cerulea Dolens** is due to massive thrombophlebitis of the iliofemoral vein. It commences with tingling and numbness of the extremity. Suddenly the patient cries out with



cramp in the limb (calf or thigh), which soon becomes deeply cyanotic and greatly swollen, especially below the knee. The pain continues, and is often described as 'bursting' in character. The swollen portion of the limb feels tense, firm yet rubbery, and there is relatively little pitting-on-pressure. Soon after the iliofemoral vein becomes blocked, shock, proportional to the amount of blood lost to the circulation by being imprisoned in the limb, is always present; sometimes it is profound. For as long as 45 minutes the limb remains at body temperature, then it cools slowly to room temperature. Gangrene appears to be extensive (*Fig. 699*) but usually the circulation is better than it appears and gangrene of the toes only is the aftermath.

Because he is unable to feel arterial pulsation in the affected limb, often the clinician diagnoses arterial embolism. If he realizes that the radial pulse is weak because the patient is shocked, and that he cannot feel the pulses in the affected lower limb because the tissues overlying the arteries are bloated and stiff with oedema, absent pulsation in a greatly swollen limb suggests that the main vein, and not the main artery, is blocked.

**Thrombosis of the Axillary Vein.**—Although commonly ascribed to trauma at least 10 per cent of patients have no history of an accident and first notice the abnormality on waking in the morning. On the other hand, in a number of instances the swelling does come on after particularly strenuous use of the arm. Typically the patient is an active young or middle-aged individual, and in 80 per



*Fig. 700.*—Enlargement of superficial veins consequent upon spontaneous thrombosis of the axillary vein.



*Fig. 701.*—Swollen arm resulting from spontaneous thrombosis of the axillary vein.

cent of cases male. The temperature and pulse-rate are normal. As a rule the swelling involves the whole arm, from the shoulder-girdle to the fingers; not infrequently the lower part of the neck on the affected side shares in the swelling. The superficial veins, especially those running to the superior thoracic inlet, are more prominent than usual (*Fig. 700*). As a rule a dull ache is experienced in the arm; sometimes there is no pain, at others shooting pain is severe. Fatal embolism has not been reported. The swollen arm (*Fig. 701*) is firm, but exhibits slight pitting-on-pressure.

**Superficial Thrombophlebitis.**—Superficial thrombophlebitis is, generally speaking, of itself a far less serious condition than deep thrombophlebitis. It can, however, be the only outward and visible sign of grave disease unconnected with the veins or the blood that they transmit.

**Superficial Thrombophlebitis of a Varicose Vein** (*see Fig. 78, p. 36*).—The signs of inflammation are readily apparent and the thrombosed portion of the varix feels like a firm cord. Usually such thrombophlebitis appears without apparent cause; occasionally a leg ulcer is present, from which, presumably, the infection arose. Intravenous fluid therapy is another potent cause.



Two possible complications may supervene: (a) Suppuration (a most serious condition because pyaemia threatens), and (b) Extension of the thrombus along a perforating vein to the deep veins of the leg, or via the termination of the long saphenous vein to the femoral vein, with all the dangers that attend deep thrombophlebitis. Happily, neither of these complications is common. Nevertheless it is advisable to mark the upper limit of the inflammation with a skin pen, so that should the thrombophlebitis be extending in an upward direction the fact can be noted at the next visit.

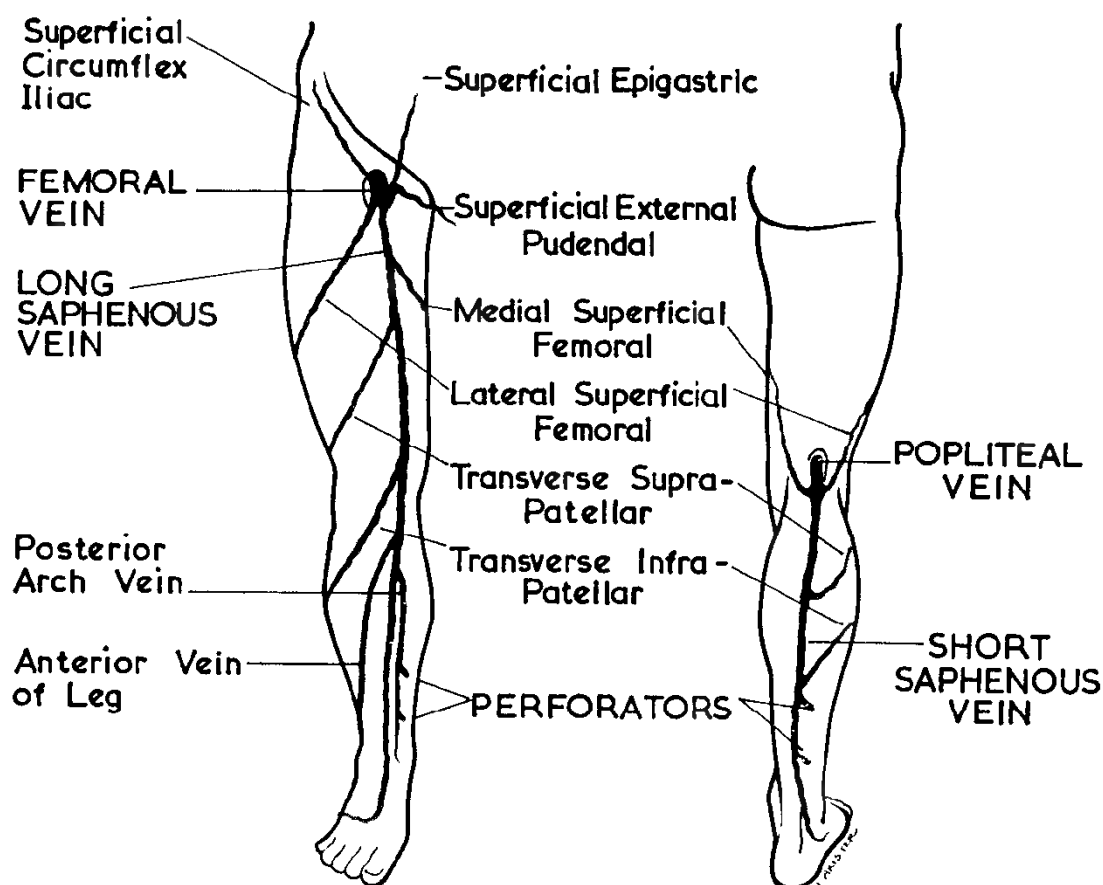


Fig. 702.—Showing the possible anatomical distribution of varicose veins and the named intercommunicating veins between the long and the short saphenous veins. A common anomaly of the latter is for it to perforate the deep fascia, more or less in the midline, somewhere below the popliteal fossa. When the long saphenous vein is varicose, blood can pass from it along an intercommunicating vein to the short saphenous vein, and vice versa. The usual ankle perforating veins are also shown, but perforators may be found anywhere in the lower limb notably entering the subsartorial canal above the knee.

**Thrombophlebitis Migrans** occurs in previously normal veins, and in many instances appears in patients who seem otherwise to be in good health. The thrombophlebitis makes its début spontaneously in almost any superficial vein, and reappears at first here, then there, the intervals between the visitations being days, weeks, or even years. On no account regard the condition as a minor malady, and above all do not send the patient on his way rejoicing. Regard it as a sinister sign and one unprecedented, for its presence foretells with almost mathematical precision that one or other of the two following capital diseases is lurking in the background.

a. *Visceral Carcinoma* (Trousseau's Sign), especially of the pancreas (see p. 245)

ARMAND TROUSSEAU, 1801 1867, Physician, Hôtel-Dieu, Paris, noted the sign as his death warrant, confirming his suspicion of stomach cancer.

or the stomach (*see* p. 233). Therefore, in every case a diligent examination of all the viscera by every means available is imperative.

*b. Thrombo-angiitis Obliterans.*—Wandering superficial thrombophlebitis is one of the diagnostic features of this disease (*see* p. 392).

**Mondor's Disease** (*Phlebite-en-cordon*; string phlebitis) is a self-limiting thrombophlebitis of veins coursing over the upper chest wall towards the axilla. It is somewhat more common in females, and is, apparently, less rare in France than in Britain. The subcutaneous cord or cords thus produced feel precisely like those that occur in thrombosis of the dorsal vein of the penis (*see* p. 365). In the female a vein overlying the breast may be affected, and has been mistaken for carcinoma. This misdiagnosis has raised the condition from a curiosity to one of real diagnostic importance.

### VARICOSE VEINS

Varicose veins are easily the most common of the peripheral vascular diseases. By definition, varicose veins are tortuous, dilated, and lengthened, with incompetence of the contained valves. This excludes the visible leg veins of young adult males and athletic females.

Varicosities usually involve either the long or short saphenous vein, or their tributaries (*Fig. 702*). The long saphenous vein (*Fig. 703*) becomes varicose seven times more frequently; sometimes both are implicated.

**The Perforating Veins** connect the superficial with the deep veins by piercing the deep fascia. They have been described in over 200 varying situations. In the case of the long saphenous vein the main perforators are arranged in three sets—one set in relation to the subsartorial canal, a second set in relation to the calf muscles, and a third set just above the ankle-joint. When the valves of the lowest set become incompetent, contractions of the calf muscles (which normally propel the venous blood upwards) cause a reverse flow through the perforating veins and there results a high-pressure reflux which Cockett describes as a 'blow-out', viz. —————→  
It is this high-pressure reflux that gives rise to the *flare sign* referred to on p. 539.



### EXAMINATION OF A PATIENT SUFFERING FROM VARICOSE VEINS.—

**Inspection.**—With the patient standing, the lower limbs are scrutinized from the umbilicus to the toes. Attention is directed (as it has been on numerous occasions in this book) to the necessity of viewing the back of the legs as well as the front. It is necessary to labour this point because often the clinician becomes so absorbed in varicosities connected with the long saphenous vein, or is short of time, and omits to ask the patient to turn round; and consequently varicosities of the short saphenous vein are often overlooked (*Fig. 704*).

A careful note is made of the anatomical distribution of the varices (*Fig. 702*), particularly of perforating veins.

It is highly important to inspect the lower abdomen and the pubes. In the male there is no contra-indication to doing it at this stage; in the female this additional exposure in the standing position is repugnant to the patient, and it should be avoided in favour of an abdominal examination when the patient is lying down.

**Palpation.**—The limbs are palpated lightly, particularly over the courses of the short and long saphenous veins. In persons with fat limbs, superficial varicose veins are often palpable when they are not visible. This applies particularly to the areas immediately above an ulcer, and to the proximal portions of both saphenous veins.

At this juncture, especially in cases of bilateral varicosities, it is imperative to ask oneself the question:—

**Are these Varicose Veins Primary or Secondary?** Especially when some of the affected veins do not conform to the usual pattern, e.g., there are varices on the pubis, or there is a lower abdominal operation scar which suggests the possibility of a bygone postoperative thrombosis, secondary varicose veins must be excluded. In practice only the first cause below is at all common.



Fig. 703.—Varicose veins. Left long saphenous vein mainly affected, but medial perforators are also present.



Fig. 704.—Varicosities connected with the short saphenous vein.

1. Pregnancy.
2. An intrapelvic neoplasm (uterus, ovary, rectum) which can obstruct the free deep venous return, and so encourage the development of secondary superficial varicose veins. Usually, however, the presence of such a tumour associated with varicosities is a coincidence.
3. Compensatory varicose veins sometimes are one of the late complications of iliofemoral phlebothrombosis.
4. Superficial varicosities are often present with arteriovenous fistula (*see* p. 407).

**Venous Stars** are wont to occur in association with elevations of venous pressure. They are common on the dorsum of the foot, as well as on the legs, especially above the knee on the medial aspect of the thigh of patients with varicose veins. They are particularly numerous in persons with obstruction to the vena cava and in pregnant women (Bean). Digital pressure easily squeezes blood from the star; upon sudden release, it fills from the centre.

**The Cough Impulse Test.**—When indubitably positive, this test is a clear indication that the valves of the long saphenous vein are incompetent. The fingers are laid on the thigh just below the saphenous opening, in such a way that the pulp of the middle finger rests upon the vein (*Fig. 705*) or, when not clearly visible, where the vein should be. The patient is asked to cough. A fluid thrill is imparted to the finger if the valve at the saphenofemoral junction is incompetent.

**The Percussion (Tap) Sign (Chevrier).**—With the patient still erect, place the fingers of the left hand just below the saphenous opening. Percuss the main bunch of varicosities once with the right middle finger. When valves within the segment under review are incompetent there will be no barrier to the upward wave of blood, and an impulse will be felt by the fingers overlying the long saphenous vein above.

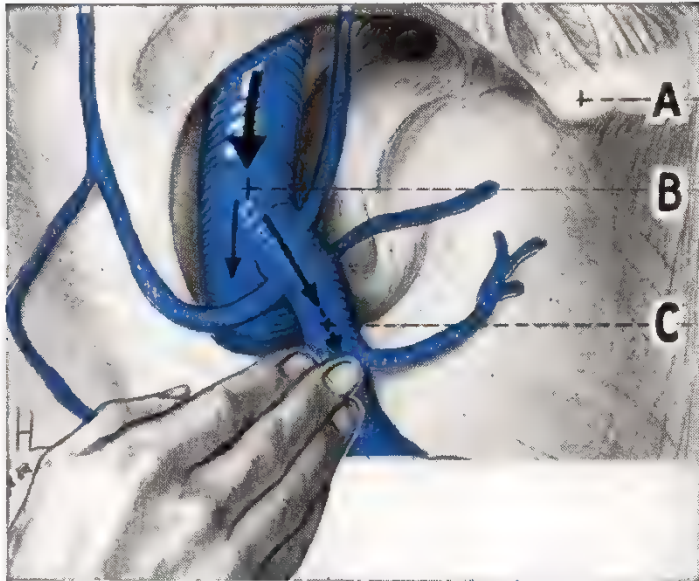


Fig. 705.—Eliciting the cough impulse test. A, Pubic spine; B, Femoral vein; C, Long saphenous vein.



Fig. 706.—Varicosity of a very large lateral superficial femoral vein. The Brodie-Trendelenburg test (see below) was positive for the whole length of this vein.

In most instances anatomical charting of the distribution of veins together with the cough and tap signs is sufficient for accurate diagnosis and other tests are relatively infrequently necessary.

**The Brodie-Trendelenburg Test.**—The patient lies down on a couch, and the limb is raised to allow the blood to drain out of the veins (Fig. 707 A). The fingers (or thumb) are placed firmly over the saphenous opening. Still keeping firm pressure over this point, lower the limb and instruct the patient to stand (Fig. 707 B). The hand is removed suddenly. If the veins fill immediately, it is obvious that the valves in the saphenous vein are incompetent, and the sign is positive (Figs. 706, 707 C).

**Seeking the Sites of Perforators—Fegan's Method.**—Mark the varicosities with a skin pen while the patient stands; ask her to lie down and raise the affected limb and rest the heel against the examiner's upper chest (Fig. 708). Palpate the line of the marked varicosities carefully for gaps in the deep fascia through which the perforating veins pass; they are felt as circular openings with sharp edges and are marked with an X. To confirm that the superficial varicosities fill from the perforators the Brodie-Trendelenburg test can be applied.

**Test for Patency of the Deep Veins.**—It is now realized that deep veins which have been the site of thrombotic occlusion almost invariably recanalize with the passage of time. If the patient complains of persistent 'bursting' pain in the lower leg on standing, the test for deep-vein patency is carried out.

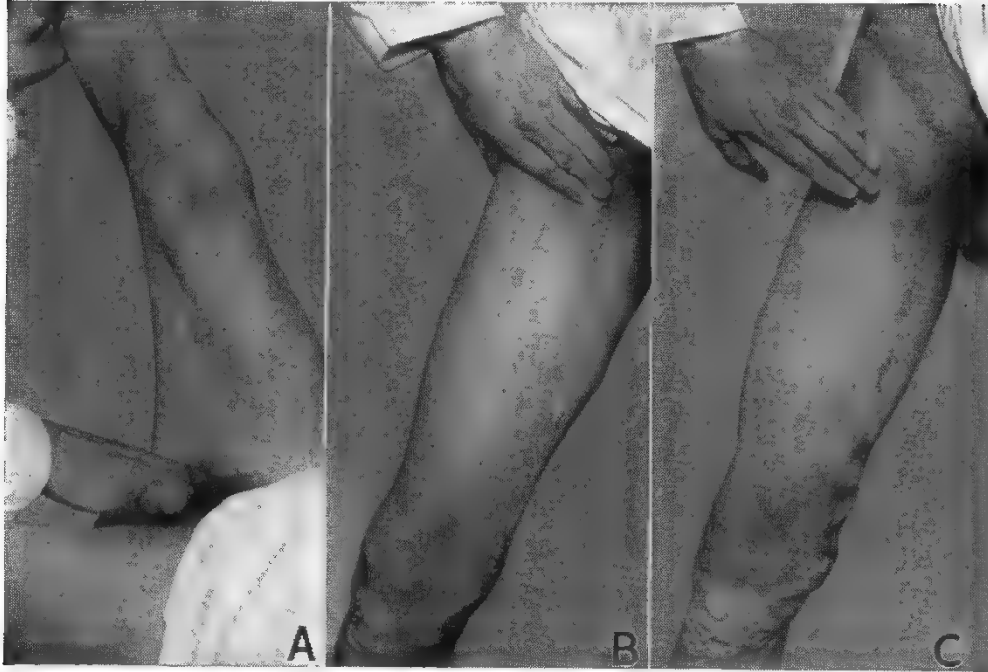
PAR L. CHEVRIER, *one time Ancien Prosecteur des Hôpitaux de Paris.*

SIR BENJAMIN BRODIE, 1783–1862, *Surgeon, St. George's Hospital, London, described this test most lucidly in 1846.*

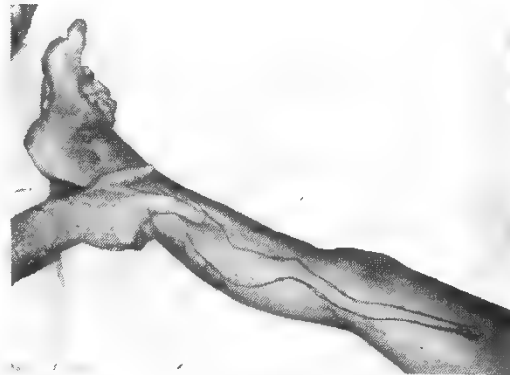
FRIEDRICH TRENDELENBURG, 1844–1924, *Professor of Surgery, Leipzig, popularized the test.*

GEORGE FEGAN, *Contemporary Professor of Surgery, Trinity College, Dublin.*





*Fig. 707.*—The Brodie-Trendelenburg test. **A**, The limb is raised in order to empty the veins of blood, after which a finger (or tourniquet) is placed over the saphenous opening; **B**, The finger is still kept over the saphenous opening whilst the patient stands upright; **C**, The pressure over the saphenous opening has just been released, and the vein has filled from above downwards—the test is therefore positive.



*Fig. 708.*—Fegan's method of palpating for perforating veins after marking the varicosities with a skin pen.

While the patient stands, a rubber tourniquet is applied around the thigh, tight enough to occlude the long saphenous vein but not the deep veins. The patient walks for 5 minutes. If the pain of which the patient complains is brought on it is proof that the deep veins are still occluded. Additional evidence is that superficial varicosities (if present) become more prominent as their only route of emptying (the long saphenous vein) is blocked by the tourniquet.

#### ARTERIOVENOUS FISTULA

**Congenital Arteriovenous Fistula.**—The lower extremity is the most common site, but the abnormality can also be situated in the upper extremity, the head, or the neck, in decreasing order of frequency. As a rule the patient presents in youth, but may do so later in life. Leading signs are as follows:—

1. *Leg Ulcer\** (see p. 541) is frequently the presenting lesion. It is due to diversion of blood away from the skin. Often the ulcer is extremely painful.

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\* Known in the U.S.A. as a 'hot ulcer' because the surrounding skin feels warmer than normal.



2. *Varicose Veins and Port-wine Discoloration of the Skin* (Fig. 709).—This combination is always extremely suspicious of arteriovenous fistula.

3. *Local Gigantism*.—If, as is frequent, the arteriovenous connexions are widespread and the patient is young, increased length and girth of the limb ensue. Lack of this knowledge invites the mistake of attributing inequality of limb lengths (and the scoliosis that ensues) to shortness of the unaffected leg.



Fig. 709.—Varicose veins and port-wine staining due to arteriovenous fistula. The affected leg is longer than its fellow.

4. *Increased Local Warmth*.—The extremity is appreciably warmer, and usually moister than that of the unaffected side.

5. *Collapsing Arterial Pulse* (Corrigan's Pulse).—This sign, usually taught on the medical wards, can be demonstrated on the foot pulses.

6. *The Bradycardiac Reaction*.—Digital occlusion of the main artery to the limb is followed by slowing of the pulse-rate. A positive reaction is indicative that a considerable volume of blood is being short-circuited.

7. *The 'Machinery' Murmur*.—With a stethoscope applied over the site of the fistula a *full-circuit bruit* with systolic accentuation is pathognomonic of an arteriovenous fistula. The bruit is high pitched and musical.

There are two varieties of congenital arteriovenous fistula—*localized* and *diffuse* (Robertson). In the diffuse variety, which is relatively common, the arteriovenous communications are deep and clinically indiscernible (probably in the bone). In these cases (6) and (7) will be absent.

**Acquired Arteriovenous Fistula** is a result of a wound, usually a stab or through-and-through gunshot wound. Often the superficial situation of the involved vessels enables the clinician to palpate the resultant aneurysm. The sign of an aneurysm (*see p. 27*) may be present. The other signs of arteriovenous fistula described above (except (3)) can be observed, particularly (5), (6), and (7).

This condition is an unusual, but definite, complication of lumbar disk surgery, the communication being between the common iliac artery and vein.

## THE LYMPHATICS

### SIGNS ASSOCIATED WITH LYMPHATIC OBSTRUCTION

Oedema of the extremities may be due to venous or lymphatic blockage. Persistent swelling of the limb seldom is due to the former unless the inferior vena cava is obstructed (bilateral swelling up to the groin), or a common iliac vein is occluded (unilateral swelling). Look for evidence of venous collateral circulation (*see pp. 18, 257*). Most instances of *long-continued* limb oedema are due to lymphatic disease (lymphoedema) in which the oedema is firm (solid) but may pit to a variable extent (*see p. 9*).

Two varieties of lymphoedema can be distinguished, *secondary* which is commoner by far in practice, and *primary* which is seen more often in vascular clinics. The former follows damage and obstruction to the lymphatic pathways by malignant disease involving the lymph-nodes, by filariasis (*see Fig. 601, p. 346*), and by surgical block dissections. Repeated attacks of inflammation (cellulitis) are common in both types and the swelling tends to increase with each attack so that in the course of time the limb reaches massive proportions (*elephantiasis*). The skin becomes hyperkeratotic and fissured so that the limb is pachydermatous in appearance as well as size (*Fig. 710*).

SIR DOMINIC CORRIGAN, 1802–1880, *Physician, Jervis Street Hospital, Dublin*, described the collapsing pulse of aortic regurgitation.  
DOUGLAS J. ROBERTSON, *Contemporary Surgeon, Royal Hospital, Sheffield*.

**Primary Lymphoedema.**—Radiological demonstration of the lymphatic pathways (lymphangiography) has clarified the aetiology (Kinmonth).

*Aplasia.*—There is complete absence of subcutaneous lymph-trunks. The swelling is present from birth and if the condition is familial as well as congenital, the term Milroy's disease (*see Fig. 19, p. 11*) is correct.

*Hypoplasia* is easily the commonest variety. The lymph-trunks are fewer and smaller than usual. The oedema commences in childhood or early adult life, usually after an attack of cellulitis.



*Fig. 710.*—Pachydermatous skin associated with elephantiasis.

*Hyperplasia.* The lymphatics are enlarged, increased in number, and tortuous. This variety is thus analogous with varicose veins. Chyle often runs downwards past incompetent valves and appears on the skin surface as discharging vesicles of milky liquid, a unique sign.

**Lymphoedema in the Tropics.**—Although filariasis is the classical cause, in practice chronic sepsis is commoner, with tuberculous lymphadenitis in second place. The scrotum, which may become enormous, equalling the rest of the body in weight in exceptional cases, the labia (*see Fig. 601, p. 346*), and the lower limbs are notably affected. At first pitting on pressure can be demonstrated, but as the condition becomes chronic the swelling becomes solid.

## CHAPTER XXVII

## THE PERIPHERAL NERVES

THE examination of a peripheral nerve lesion consists essentially of three separate parts: (1) General inspection of the injured or otherwise affected member; (2) Examination of motor defects; (3) Examination of sensation.

## GENERAL INSPECTION OF THE INJURED MEMBER

*a.* At times, as the result of a nerve injury the limb, or a portion thereof, takes up an attitude so characteristic as to suggest the diagnosis—for instance, the ‘tip’ position of Erb-Duchenne paralysis; the dropped wrist of a radial nerve lesion; the pointing index attitude of median nerve palsy.

*b.* When a nerve lesion is noted with a *recent* injury bear in mind the following points:—

*i.* A sharp object, e.g., broken glass, has almost certainly severed the nerve. Operative treatment is essential.

*ii.* Blunt trauma due to a missile may have severed the nerve but rupture of fibres within an intact sheath (axonotmesis) is also possible. It is best to explore the nerve at the time of the operation necessary to remove the missile.

*iii.* A fractured bone or dislocation, when it causes nerve injury, almost always causes axonotmesis, and an expectant attitude can be adopted.

*iv.* Traction injuries of nerve result in damage to a long length of the nerve; the outlook for recovery, even with operative repair, is poor.

*c.* If an *old* wound or scar is present, its position in relationship to underlying structures must be noted. Scars should be examined for tenderness, adherence to deep structures, and bulbous enlargements of divided nerve ends.

*d.* With a fairly recent complete lesion of a sensory or a mixed nerve, the skin has a pink, or even a rosy appearance, and because of vasodilatation due to severance of the sympathetic nerve-fibres, often evidence of desquamation can be seen a few days after the injury. A similar lesion of considerable standing shows dry, mottled blue skin. On the contrary, in the case of an incomplete irritative lesion, the skin may be red, glossy, and perspiring (causalgia or Weir Mitchell’s skin).

*e.* The nails should be inspected for curvature, ridging, change in colour, and absence of gloss.

**Causalgia.\***—The affected nerves are large, especially the median and medial popliteal, i.e., those supplying the palm and sole; in all cases the injured nerve has been divided incompletely. While the phenomenon is not uncommon after war injuries, it is exceptional after injuries sustained in civil life. It is characterized by pain—persistent, severe, and usually described as ‘burning’ or ‘hot’. Many of the patients seek relief by applying cold compresses to the affected part. There is a lowering of the threshold for noxious sensory stimuli—noise, in particular, causes intensification of pain. The *Skin* covering the affected part is tight, thin, and glossy. It is *less* sensitive to heat, cold, and pin-prick than normal skin, but it is hypersensitive to light touch, and exceedingly tender to pressure. The *Nails* grow rapidly, and are curved and exquisitely tender.

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\* *Causalgia*. Greek, καῦσις = heat + ἄλγος = pain.

## EXAMINATION OF MUSCLES

While the practical clinical methods of ascertaining whether an individual muscle is contracting or not will be given in the text that follows, attention is directed here to a system of grading muscle power\* which has earned world-wide approval:—

5. Contraction against powerful resistance (normal power) = 100 per cent.
4. Contraction against gravity and some resistance = 75 per cent.
3. Contraction against gravity only = 50 per cent.
2. Movement only possible with gravity eliminated = 25 per cent.
1. Flicker of contraction but no movement = 10 per cent.
0. Complete paralysis = 0 per cent.

The possibility of substitution ('trick') movements are eliminated by adhering to the simple methods described. The hand muscles in particular often have dual innervation (motor overlap).



Fig. 711.—Testing for touch sensation with a wisp of cotton-wool.



Fig. 712.—Testing for pain sensibility.

## EXAMINATION OF SENSATION

The patient is placed so that no muscular effort is necessary to maintain the position of the limb being examined. With his eyes closed, he is told to respond as follows:—

*a. Touch Sensation* is tested by stroking the skin with cotton-wool (Fig. 711). The patient says 'Yes' when he feels *anything*. This test cannot be relied upon if the skin is clad with hair, e.g., on the dorsum of the hand.

*b. Pain Sensation.*—A sharp pin is used (Fig. 712), and care must be taken that the patient understands that he is to say 'Sharp' only when he feels the pain of a pin-prick, not when he feels pressure or touch. Unless this precaution is taken, the method is entirely inaccurate.

*c. Temperature Sensation.*—This can be tested readily by filling two test-tubes, one with hot and one with cold water, and applying them in turn to the skin of the affected part, at the same time noting the patient's remarks on whether he feels 'Hot' or 'Cold'. For practical purposes this test is only of value to the surgeon if syringomyelia is suspected.

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\* Drawn up by the Medical Research Council, London.

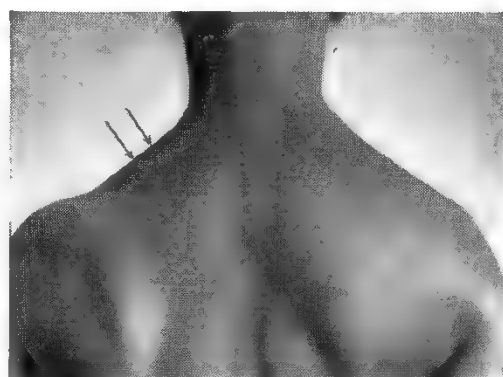
In surgical practice a peripheral nerve lesion usually results from trauma (sometimes at operation), and only occasionally from disease (particularly pressure by tumours). Interruption of a nerve-trunk can be detected most easily by testing for loss of power of individual muscles, which will be considered for the commoner injuries. The findings for touch and pain sensory loss are not detailed as they are dealt with in neurological and anatomical texts. Neither deep pain sensibility, nor tactile localization and discrimination, is discussed as they are of purely neurological interest.

### THE CERVICAL PLEXUS

**The Accessory Nerve** supplies the sternomastoid and trapezius muscles. Although it is the 11th cranial nerve, and consequently is mentioned in connexion



*Fig. 713.*—Paralysis of the accessory nerve. Answer to the request 'Shrug your shoulders'; the shoulder on the side of the lesion fails to shrug.



*Fig. 714.*—Characteristic flattening following a lesion of the accessory nerve. Note the winging of the scapula compared with that of the opposite side.



*Fig. 715.*—Paralysis of the right cervical sympathetic. Note the pseudo-ptosis and myosis.

with the examination of cranial nerves on p. 58, because it is derived from the cervical plexus, its main consideration has been postponed to this chapter. Paralysis of the above muscles is recognized easily: (1) Ask the patient to shrug his shoulders; that the trapezius is paralysed becomes obvious because the shoulder of the affected side fails to shrug (*Fig. 713*); (2) In cases of *some standing* there is



wasting of the trapezius, which causes an alteration in the contour of the lower part of the neck and the adjacent portion of the shoulder of the affected side (*Fig. 714*); (3) There is weakness of the sternomastoid muscle, which is tested as shown in *Fig. 282*, p. 139.

**The Cervical Sympathetic Chain.**—Preganglionic nerve-fibres designed for the supply of orbital structures arise in the spinal segments T.1 and T.2. These fibres traverse the corresponding nerve-roots, and, as white rami communicantes, enter the cervical sympathetic chain, lesions of which produce characteristic signs, mainly affecting structures in the orbit.

**Horner's Syndrome.**—In surgical practice this is found most frequently:—

1. In Klumpke's paralysis and complete brachial plexus injuries (*see* p. 414).
2. As a complication of a wound in the neck.
3. When the nerve is involved by a cervical (*see* p. 158) or thoracic neoplasm (*see* p. 195).
4. After cervical sympathectomy.

Examine the eyelids. There is pseudo-ptosis (*Fig. 715*). The upper-lid droops incompletely, for the cervical sympathetic innervates only one-third of the levator palpebrae superioris. The affected pupil is smaller. In this connexion a good test is the *spinociliary reflex*. Pinch the skin of the neck and the pupil on that side will dilate. In Horner's syndrome no such dilatation occurs. Anhidrosis (absence of sweating) is present on the side of the lesion so that the palm of the hand feels dry.

If the cervical sympathetic nerve is injured early in life, as in a severe brachial plexus injury, the iris on the affected side fails to develop pigmentation at the proper time, and remains blue for many months, even if the other eye is brown. Later, pigmentation is in a patchy manner, giving the iris on the affected side a marbled appearance.

## THE BRACHIAL PLEXUS

**Injury of Nerve-roots.**—There are two types of resulting paralysis—i.e., the upper (Erb-Duchenne paralysis) and the lower (Klumpke's paralysis). Increasingly, with the trauma of modern traffic accidents, complete brachial plexus paralysis is seen; the whole limb shows a flaccid paralysis with loss of pain sensation of the hand, forearm, and lower arm. Paralysis of the cervical sympathetic (*see above*) is usual.

**Erb-Duchenne Paralysis** is due to an injury of C.5 and C.6 nerve-roots, resulting from excessive lateral displacement of the head with forcible depression of the shoulder. Usually it occurs in babies during a difficult confinement, but also later in life from a weight falling upon the shoulder, or an accident producing a similar impact. Diagnosis is easy, for the affected arm lies limply by the side in the characteristic 'waiter's tip' position (*Fig. 716*). Movements dependent upon the integrity



*Fig. 716.*—The arm is held in the 'waiter's tip' position. Erb-Duchenne paralysis.

JOHANN F. HORNER, 1831–1886, *Professor of Ophthalmology, Zürich, Switzerland.*

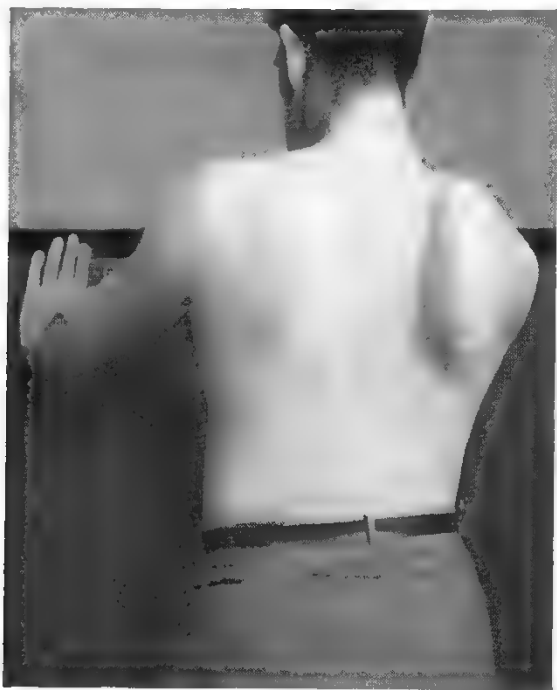
WILHELM H. ERB, 1840–1921, *Professor of Medicine, Heidelberg.*

GUILLAUME B. A. DUCHENNE, 1806–1875, *General Practitioner in Boulogne and Paris.*

of the muscles of the forearm and hand are capable of being carried out, while those of the elbow and shoulder joints are greatly restricted. Thus the successive movements in lifting a drinking glass to the lips are considerably impaired.

**Klumpke's Paralysis** is due to a lesion of C.8 and T.1. This is encountered most often as the result of a forceful cephalad pull on the child's arm during birth. Less often it is sustained later in life as a result of a dislocation of the shoulder-joint or a violent upward pull on the arm, such as might be occasioned by grabbing at a ledge while falling from a height. This lesion gives rise to paralysis of all the intrinsic muscles of the hand; eventually a true claw-hand results. Loss of sensation along the ulnar side of the arm, forearm, and hand also occurs. Finally, it is necessary to look for paralysis of the cervical sympathetic (*see* p. 413) because the sympathetic fibres traversing the anterior primary rami of T.1 are sometimes implicated in this lesion. This indicates that the lesion of T.1 is near its exit from the intervertebral foramen, and therefore is in an inaccessible position.

**The Circumflex Nerve** can become torn or compressed in dislocation of the shoulder, in fracture of the neck of the humerus, and occasionally in fracture of the scapula. Palsy results in atrophy of the deltoid muscle (*see* Fig. 776, p. 458) and consequently abduction of the arm is compromised. To avoid 'trick' movement the arm must be parallel to the trunk when testing.



*Fig. 717.*—Lesion of the nerve to serratus anterior. When the patient pushes against a wall with both hands, the scapula on the affected side stands out like a wing.



*Fig. 718.*—The normal latissimus dorsi can be felt to contract when the patient coughs.

**The Musculocutaneous Nerve** innervates the biceps, coracobrachialis, and brachialis muscles, paralysis of which is detected easily by asking the patient to stand with his arms outstretched, then to clench his fists and do 'dumb-bell' exercises slowly. The contracted biceps muscle belly can be seen easily if it is acting.

**The Nerve to Serratus Anterior** (Nerve of Bell), because of its long straight course, may be traumatized by over-stretching during heavy weight-lifting in certain occupations, for instance that of a furniture remover. It is also liable to be severed during the operation of radical mastectomy. Paralysis is demonstrated by asking the patient to push against a wall with his outstretched hands; the scapula on the affected side becomes *winged* (Fig. 717).

**The Nerve to Latissimus Dorsi** is also sometimes damaged in radical mastectomy. It is remarkable that paralysis of so large a muscle results in but trivial inconvenience, the only movement lost being strong adduction of the shoulder-joint. On grasping the muscle belly (Fig. 718) its normal contraction can be ascertained by asking the patient to cough deeply.

*The three major branches of the brachial plexus provide, in practice, the great majority of nerve lesions.* It is not our purpose here to enter into more than the minimum details of examination for everyday purposes.

#### THE RADIAL NERVE

At the elbow the nerve divides into two terminal branches—*superficial radial*, which is entirely cutaneous, and *posterior interosseous*, wholly muscular. Paralysis occurs in fractures of the shaft of the humerus, pressure from callus, gunshot



Fig. 719.—Wrist-drop due to a lesion of the radial nerve. A 'lipoma' had been excised—note the scar at the elbow—evidently this was a neurofibroma of the radial nerve. The patient is unable to extend her wrist.

wounds of the axilla and arm, and not infrequently from sitting with the arm suspended over the back of a chair or pressure by a crutch (crutch palsy). For radial nerve paralysis to be complete, it must be interrupted in the axilla.

**Motor Defects.**—If the injury is situated above the junction of the upper and the middle thirds of the humerus, the action of triceps is lost.

**Test for Triceps.**—Seat the patient with the elbow flexed to a right-angle on a table. This eliminates the force of gravity. If triceps is working the elbow can be straightened easily.

If the lesion is situated at the middle third of the humerus (a frequent site of fracture) the brachioradialis is spared. In all these lesions the characteristic deformity is *wrist-drop*, which is unobtrusive unless the patient flexes the elbow-joint with the forearm pronated (Fig. 719).

**Test for Brachioradialis.**—Flexion of the elbow is weakened if this muscle is paralysed. When the patient endeavours to flex the elbow-joint against resistance,

the brachioradialis no longer springs up to bridge the angle between the arm and the forearm as it does normally (*Fig. 720*).

The results of injury of one or other of the terminal branches of the radial nerve are as follows:—

**The Posterior Interosseous Nerve.**—Because the extensor carpi radialis longus is not paralysed and the extensor carpi radialis brevis is not always implicated, typical wrist-drop is not present, but the hand is held in radial deviation on attempting extension. Extensor digitorum is paralysed so that the patient is unable to prevent the examiner from flexing the extended fingers easily.

**The Superficial Radial Nerve** is sometimes severed in operations on the synovial extensor tendon-sheaths of the thumb (*see Fig. 804*, p. 474). The sensory loss is depicted in *Fig. 727*. This loss is also found in a higher lesion of the radial nerve.



*Fig. 720.*—Contraction of brachioradialis, absent if the radial nerve is injured in the middle of the arm or above.

#### THE MEDIAN NERVE

In civilian life the nerve is particularly vulnerable in the cubital fossa, where it is exposed to the risk of damage by misplaced intravenous injections. Another common site of injury—this time by severance—is at the wrist. It controls *coarse* movements of the hand and is the nerve of grasp. In *all* injuries, at whatever level, the patient is *unable to pick up a pin with thumb and index finger*. This is partly due to sensory loss (*see Fig. 727*).

In practice one usually knows the level of the lesion from the position of the injury. In the case of the median nerve a *recent* injury is easily missed on cursory inspection.

##### RECENT INJURY.—

The student should recall the following anatomical facts. The nerve gives off no branches until it reaches the elbow. Between the elbow and the middle of the forearm its muscle branches are given off at various levels, to supply the flexors of the wrists and digits and the pronators of the forearm. As some of these muscles have a dual nerve-supply, certain movements, which call into action those muscles which are innervated entirely by the median nerve alone, are tested.

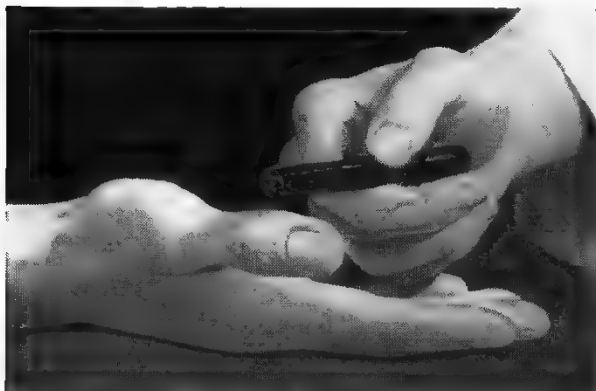
Because in the forearm this nerve is so well protected by muscles, in this part of its course it is injured but rarely. On this account, an otherwise complex situation is simplified by considering first lesions situated (*a*) in or above the cubital fossa; (*b*) at the wrist.

**Lesion in or above the Cubital Fossa.**—*Loss of the Power to flex the Interphalangeal Joints of the Index Finger:* This can be demonstrated easily by Ochsner's clasping test. Ask the patient to clasp the hands together firmly. If the median nerve has been interrupted above the level where the nerve to flexor digitorum sublimis is given off (crease of the elbow-joint) the index finger fails to flex (*Fig. 721*).

*Fig. 721.*—Ochsner's clasping test in median nerve paralysis. The index finger fails to flex.



**Lesion at the Wrist.**—Below the level of the wrist-joint the median nerve usually supplies only the flexor pollicis brevis, the opponens pollicis, and the abductor pollicis brevis. Because of the frequent variations in the nerve-supply of the first two, only tests that single out a non-functioning abductor pollicis brevis can be relied upon.



*Fig. 722.*—The pen-touching test. In this case of cut median nerve at the wrist, because of paralysis of the abductor pollicis brevis, the patient can raise the thumb no farther than is shown.



*Fig. 723.*—Testing the flexor pollicis longus. The thumb is held by the proximal phalanx, in order that no movement shall take place at the metacarpophalangeal joint.

*The Pen-touching Test for Abductor Pollicis Brevis.* The patient places his affected hand flat upon a table, palm uppermost. Tell him to keep the thumb straight and rest it upon the table, or as near to the table as possible. The clinician, holding a pen or pencil as shown in *Fig. 722*, rests his hand upon the patient's



outstretched fingers (to keep them flat). The patient is told to touch the pen with the edge of his thumb. In order to be sure that the patient understands the instructions clearly it is advisable to touch the lateral aspect of the terminal phalanx and say, 'When I tell you, bring this part of the thumb up to touch my pen.'

**Sensory Loss only**, by division of the terminal median nerve below the point where the muscular branch to the thenar muscles is given off, is a rare, one could say theoretical, possibility. *See again Fig. 727.*

**Lesions in the Forearm involving the Anterior Interosseous Nerve only.**—This again is unusual.

**Loss of Power of the Flexor Pollicis Longus.**—Can the patient flex the terminal phalanx of his thumb? The thumb is held firmly at the metacarpophalangeal joint so that no movement can take place there; then the patient is instructed to bend his thumb (*Fig. 723*). If he can actively flex the interphalangeal joint the anterior interosseous nerve (and the median nerve above its origin in the cubital fossa) is intact.

**LONG-STANDING INJURY.**—This is comparatively easily detected by the following tests.

**Lesion in or above the Cubital Fossa.**—*The Benediction Attitude (Fig. 724):* When the patient raises his arm with the palm facing the examiner, the outstretched index finger and the serial flexion of the other fingers have been likened to the attitude of the hand of a priest with his arm held aloft.



*Fig. 724.*—The pointing index or benediction position of a hand the seat of long-standing median nerve paralysis due to a lesion at the level of the elbow-joint. The pulp of the index finger has atrophied, and the finger-nail of the digit is curved like a parrot's beak. Note also the ape-like thumb.

**The Ape-like Thumb:** The thumb tends to be held in an ape-like position, that is the palmar surface of the thumb lies in the same plane as that of the rest of the palm (simian hand). The reason for this is that the action of the extensor pollicis longus (supplied by the radial nerve) and that of the adductor pollicis (supplied by the ulnar nerve) are unopposed.

**Lesion at the Wrist.**—*Wasting of the Thenar Eminence (see Fig. 301, p. 149)* is, in some long-standing cases, so evident that the outline of the first metacarpal bone is visible. It is also present with higher lesions but occasionally is lacking, owing to anomalous innervation of the flexor brevis and opponens pollicis.

*Median Nerve Compression in the Carpal Tunnel: see p. 473.*

#### THE ULNAR NERVE

At the level of the elbow-joint the nerve is vulnerable (1) from compression by a band (*see p. 467*); (2) from involvement in a fracture of the medial epicondyle

or in callus resulting therefrom; (3) from repeated knocks in this part of its course due to cubitus valgus. At the wrist-joint the nerve is not infrequently severed, often in combination with the flexor carpi ulnaris (*see Fig. 800*, p. 472), which explains why initially the nerve injury is sometimes overlooked. Again, recent injuries are not so conspicuous as old injuries, but are not so easily missed as is a recent median nerve injury. The ulnar nerve controls the fine movements of the hand, as exemplified in the delicate fingering of the pianist.

#### RECENT INJURY.—

**Lesion in or above the Cubital Fossa. Test for Flexor Carpi Ulnaris.**—Ask the patient to lay his hand palm upwards flat on a table and, keeping the fingers as straight as possible, to attempt flexion and ulnar deviation of the wrist. If flexor carpi ulnaris is functioning the tendon can be felt, and often seen, in the position shown in *Fig. 799*, p. 472.

**Lesion at the Wrist.**—*Froment's Sign* for demonstrating paralysis of the adductor pollicis is the best test for ulnar nerve injury. The patient is asked to grasp a folded newspaper firmly between the thumb and index fingers of each hand, the thumbs being uppermost, the adductor thus being brought into action (*Fig. 725*). When this muscle is paralysed, the thumb, incapable of adequate adduction, becomes flexed at the interphalangeal joint due to contraction of the flexor pollicis longus (innervated by the median nerve).

**Ulnar Claw-hand.**—The little and the ring fingers are hyperextended at the metacarpophalangeal joints, and are flexed at the interphalangeal joints (*Fig. 726*). The middle and the index fingers are much less affected, owing to the fact that the second and the first



*Fig. 725.*—Froment's sign. A positive result (right side) confirms the diagnosis of ulnar paralysis.



*Fig. 726.*—A claw-like hand resulting from division of the ulnar nerve at the wrist.

lumbrical muscles are supplied by the median nerve. Often, in long-standing cases, the little finger is so crooked that the patient complains that 'it catches in everything'. The ulnar claw-hand is a prerogative of a lesion at the wrist. So it comes about that the *ulnar nerve paradox*—the higher the lesion the less the deformity—beguiles those unfamiliar with the phenomenon. When the nerve is interrupted at or above the elbow-joint, the ulnar half of the flexor digitorum profundus muscle is paralysed,

and does not act unopposed by the interossei and lumbricals, and so the little and ring fingers are not greatly flexed; consequently there is no 'claw'.

**LONG-STANDING INJURY.**—Some months after interruption of the ulnar nerve it will be noted that, in addition to the above signs:—

*a. The Little Finger is held in Abduction:* The phenomenon, which is more evident when the patient is asked to extend the finger, is due to the unopposed action of the extensor muscles (radial nerve) which also abduct the little finger (see Fig. 800, p. 472).

*b. Hollowing between the Metacarpal Bones* is clearly apparent on the dorsum. Each time the fingers are flexed the intermetacarpal muscular wasting causes the extensor tendons to stand out, viz. —————→

The hollowing is due to atrophy of the interossei muscles, and in the case of the interval between the first and second metacarpal bones, to atrophy of the adductor pollicis as well.



#### A RAPID METHOD OF ELIMINATING AN INJURY OF A MAJOR NERVE OF THE UPPER LIMB

It is desirable that practitioners acquire a method of examination which will enable quick detection of a nerve lesion. The following routine is virtually completely reliable. If evidence of a lesion is found, more detailed testing as already outlined is necessary.

1. Test for Wrist Drop—Radial Nerve, see p. 415.
2. Ochsner's Clasp Test—Median Nerve, see p. 417.
3. Froment's Sign—Ulnar Nerve, see p. 419.

If fractures or other injuries prevent the above tests being carried out, test pain sensation in the hand. The average loss in lesions of the major nerves is depicted in Fig. 727.

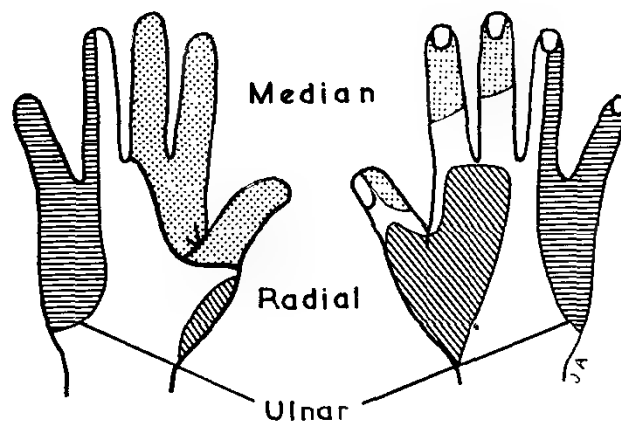


Fig. 727.—Average loss of pain sensation (pin-prick) with lesions of the major nerves of the upper limb.

#### CLAW HAND

A true claw-hand is found in several conditions, most of which have been described in this book.

1. Lesion of both median and ulnar nerves (including leprosy, see p. 423).
2. Lesion of the inner cord of the brachial plexus.

3. Klumpke's paralysis.
4. A late and severe Volkmann's ischaemic contracture (*see* p. 491).
5. An end-result of a neglected suppurative tenosynovitis of the ulnar bursa (*see* p. 486).
6. Anterior poliomyelitis.
7. Advanced untreated rheumatoid arthritis.
8. A group of uncommon conditions of neurological interest including syringomyelia, progressive muscular atrophy, polyneuritis, and amyotrophic lateral sclerosis.

A complete lesion of the ulnar nerve of some standing results in a *claw-like* hand (often called the ulnar claw-hand, *see* Fig. 726), but unless the median nerve is the seat of a complete lesion also, it cannot be called a true claw-hand.

### NERVES OF THE LOWER EXTREMITY

**The Femoral Nerve** is seldom the seat of a lesion either in peace or war. The disability is great, for the quadriceps femoris, the main extensor and stabilizer of the knee-joint, is paralysed. It can be tested by asking the patient to extend the knee with the leg dangling over the edge of the examining couch, i.e., against gravity.

**Lateral Cutaneous Nerve of Thigh.**—*Meralgia Paraesthetica* (*see* p. 514).

**The Sciatic Nerve.**—Morphologically the sciatic nerve consists of two nerves enclosed in a single sheath. Occasionally these two nerves are macroscopically separate throughout their course. Even when, as is usual, a seemingly single sciatic nerve is present, the level of its division (classically at the upper limit of the popliteal space) is inconstant. For these reasons a lesion of the sciatic nerve should be spoken of as a lesion of either the medial or the lateral component of this nerve; if both components are involved, this fact should be recorded.

#### Lesions of Both Components.—

**Motor Defects.**—A complete lesion of the sciatic nerve causes paralysis of all muscles below the knee-joint; if the lesion is in the gluteal region, paralysis of some of the hamstrings will occur also, i.e., flexion of the knee is weakened.

**Sensory Loss.**—*See* Fig. 728.

**The Lateral Popliteal Nerve**, the smaller of the two terminal branches, supplies the muscles of the anterior and lateral compartments of the leg below the knee and the short extensors of the toes. In severe injuries of the knee-joint due to adduction of the leg on the thigh it is liable to be stretched or, rarely, torn across (Platt).

**Characteristic Posture or Deformity.**—Paralysis causes the foot to assume a position of equinovarus (*see* p. 551), which, by reason of the dropped foot, results in a slapping gait and undue pressure on the outer side of the foot. The toe of the shoe is scuffed.

**Motor Defects.**—The patient can neither extend his foot nor extend his toes.

The two terminal branches of the lateral popliteal nerve are seldom injured alone. When the *musculocutaneous nerve* is damaged, on asking the patient to extend the foot it becomes inverted owing to paralysis of the peroneal muscles. In *anterior tibial nerve* lesions a similar request leads to eversion owing to paralysis of tibialis anterior muscle.

**The Medial Popliteal Nerve** is the larger terminal division of the sciatic nerve. A complete lesion of this nerve results in paralysis of all the muscles of the gastrocnemius group and all the intrinsic muscles of the sole of the foot.

**Characteristic Posture or Deformity.**—The foot is held in calcaneovalgus (see p. 552) by the unopposed action of the extensors and evertors. The disability is great, and the patient has a pronounced limp due to difficulty in 'taking off' from the affected foot. He cannot stand on tip-toe. In time the disability in walking becomes less obvious, owing to cicatricial contracture of the calf muscles. The toes become clawed from contracture of their flexors.

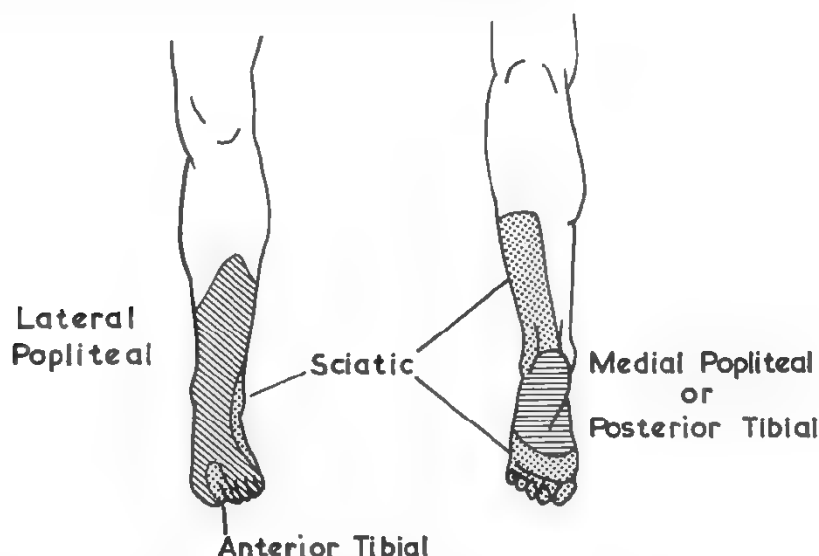


Fig. 728.—Average loss of pain sensation (pin-prick) with lesions of the major nerves of the lower limb. A complete sciatic nerve injury causes anaesthesia below the middle of the leg except for an area supplied by the saphenous nerve medially.



Fig. 729.—Typical cock-up deformity of the toes associated with diabetic neuropathy. The arrow points to a gangrenous patch of skin, due to pressure resulting from the deformity.

**Motor Defects.**—The patient cannot fully flex the ankle-joint, but a small degree is possible by contraction of the peronei muscles. Inversion against resistance is impossible. Active flexion of the toes is also impossible. The ankle-jerk is absent. If the lesion is in the lower third of the leg (*posterior tibial nerve*) all the muscular branches are spared, and sensory loss (Fig. 728) alone is evident.

The loss of sensation of the sole of the foot renders the development of a trophic ulcer or ulcers almost inevitable.



**Diabetic Neuropathy of the Posterior Tibial Nerve** is of particular surgical importance, and although it occurs at all ages, it is more commonly seen in the elderly diabetic. The cock-up deformity of the toes (*Fig. 729*) predisposes to pressure sores over the plantar surface of the heads of the metatarsals, and in diabetics with occlusive peripheral arterial disease it is the chronic infection of such a sore that accounts for the high incidence of infected gangrene in elderly diabetic patients (Oakley). Pressure on the hammer-toe deformity (*see p. 562*) also contributes. In younger patients the anaesthetic sole predisposes to a perforating ulcer in this situation.

*Tarsal Tunnel Syndrome.*—*See p. 563.*

#### A RAPID METHOD OF ELIMINATING AN INJURY OF A MAJOR NERVE OF THE LOWER LIMB

1. Satisfy yourself that the metatarsophalangeal joint is mobile (i.e., that it is not the seat of hallux rigidus). Ask the patient to bend the big toe. If it flexes adequately the medial popliteal and posterior tibial nerves are intact.

2. Then request the patient to move his big toe upwards. If strong extension can be performed, the lateral popliteal and anterior tibial nerves are intact.

Fractures and other injuries seldom prevent these simple tests, but in such circumstances test pain sensation in the leg and foot. The average loss is depicted in *Fig. 728*.

#### NEOPLASM OF A PERIPHERAL NERVE

**Neurofibroma\*** of a large or moderate-sized peripheral nerve is not common; all the more reason to be on the lookout for an example, as excision is often disastrous for the patient (*see Fig. 719*). Particular diagnostic difficulty arises when a cord of the brachial plexus is involved, as the swelling is liable to be mistaken for an enlarged lymph-node. The swelling is solitary and, as a rule, fusiform in shape. Its consistency varies; often it is moderately soft, and consequently it is liable to be confused with a lipoma. Pressure upon the lump often gives rise to tingling 'pins and needles', or actual pain down the course of the nerve. These tumours rarely become malignant (with the exception of von Recklinghausen's Disease of Nerve (*see p. 29*) in which individual neurofibromata sometimes become sarcomatous). A similar tumour sometimes occurs at the end of a nerve in an amputation stump (amputation neuroma), or in any case where a divided nerve has failed to unite. Any swelling adjacent to a nerve can cause exactly similar signs, e.g., a ganglion.

#### LEPROSY

The effects of Hansen's disease (a better name because of the stigma attached to the term 'leper'), with over ten million sufferers in tropical and subtropical regions, are due to infiltration of the superficial tissues by the bacillus which seldom penetrates to a depth of more than a centimetre. If the bodily resistance is poor, the subcutaneous tissues become infiltrated with granulomatous masses, producing the well-known leonine facies (lepromatous leprosy). An early sign is loss of the outer half of the eyebrow hair (*Fig. 730*). If Hansen's disease is suspected, look also for destruction of the nasal cartilages, causing a saddle-nose deformity (*cf. Fig. 173, p. 88*), and testicular atrophy (*see p. 381*) or gynaecomastia (*see p. 181*) which are sometimes found.

Surgical treatment is possible both for the relatively early deformity of lepromatous leprosy mentioned above, or for the late results of nerve paralysis due to tuberculoid leprosy. It is not necessary, here, to emphasize the importance of early *medical* treatment.

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\* Neurofibroma arises *in* the nerve and cannot be removed without destroying the nerve. Neurilemmoma arises in the sheath and removal is possible with conservation of the nerve.

Tuberculoid leprosy generally has strictly localized effects without much tissue reaction. Local infiltration of nerves *where they pursue a superficial course* is a typical and, in fact, the common result, hence the consideration of the disease in this chapter. Mixed (dimorphous) forms do occur. Regarding the nerve lesions, anaesthesia is a prominent feature, with paralysis relatively in abeyance.



Fig. 730.—Loss of the outer half of the eyebrow in leprosy in an Indian.

Look for tender thickening of the following nerves, particularly the first two, if Hansen's disease is suspected.

*Ulnar nerve* at the elbow.

*Great auricular nerve* in the posterior triangle below the ear.

*Lateral popliteal nerve* as it winds round the neck of the fibula.

*Median nerve* at the wrist above the flexor retinaculum.

*Posterior tibial nerve* above the flexor retinaculum behind the medial malleolus.

Next, test sensation and the motor functions of these nerves as described earlier in this chapter.

If, in an early case, there is still doubt about the diagnosis, a scraping of the nasal mucosa for the bacillus or biopsy of a skin nodule must be carried out.

**Late Deformities.**—These are found in primitive communities in whom the disease has been allowed to progress untreated, or among patients adequately treated with drugs, but who have not been taught to protect the anaesthetic areas. Trophic ulcers are thus common.

Ulnar claw hand (*see Fig. 726*).

Claw foot (*see Fig. 728*).

Progressive absorption of anaesthetic digits, due to repeated minor traumata (burns, knocks at work), then occurs. Ultimately the stumps of the hands and feet suffer similarly.

## CHAPTER XXVIII

## BONE

MANY bone conditions are described on a regional basis in other parts of this book, particularly tuberculosis (which really involves bone along with joint), and several varieties of osteochondrosis.

## OSTEOMYELITIS

## ACUTE OSTEOMYELITIS

This is mainly a disease of childhood. After the age of 12 years there is a decided decrease in incidence, but in 12 per cent the patient is an adult.

Like many surgical infections, the signs are both general and local, and this is a leading example where these two groups of signs must be collected with care, weighed in the diagnostic balance, and then correlated. The younger the patient and the more overwhelming the general infection, the greater the difficulties in arriving at a correct diagnosis. Green has analysed the physical signs present at the time of admission in a large series, with the following results: -

Pyrexia		Limitation of Joint Movement	53 per cent
With rigors 10 per cent	} 94 per cent	Local Erythema	50 per cent
Without rigors 84 per cent		Local Heat	47 per cent
Local Swelling	84 per cent	Fluctuation	18 per cent
Local Tenderness	80 per cent	Effusion into Nearby Joint	9 per cent

The bone affected is, in order of frequency, a tibia, femur, fibula, humerus, calcaneus, radius, ulna. Of the remaining bones of the body, any can be attacked.

Radiography plays such an important part in the diagnosis of bone disease that students, and not a few practitioners, are surprised to learn that radiographs are quite valueless\* in the detection of early acute osteomyelitis. This all-important diagnosis—the most urgent connected with bone—must be made by clinical methods. The classic description of the local findings is ‘a deep-seated brawny swelling situated near a joint’; but if, before diagnosis, we relied upon the development of this the patient would be robbed of the benefits of early treatment.

The examination should be conducted as follows:—

*The Pointing Test.*—If the patient is old enough he will be able to signify which bone is painful (although he may refer the pain to the neighbouring joint).

*Inspection.*—Compare carefully the two sides for minor degrees of swelling. Look for an abrasion or other superficial lesion where organisms might have entered.

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\* In a neonate radiographs, instead of being normal for a period of approximately ten days, show changes in a few days.

*Test for Localized Heat* as described on p. 9. In doing this it may be appreciated that there is exquisite local tenderness.

*Pressure over the Bone* (see Fig. 753, p. 442) is often helpful, especially in early or mild cases. Commence by placing the pulp of the index finger over the bone at a

distance from the suspected site of the disease. If pain is not complained of, exercise increasing pressure; sometimes as the pressure increases the patient will cry out quite suddenly. Repeat the manœuvre nearer the suspected epiphysis, proceeding very gently if pain has been caused by more remote pressure. By this means a point of maximum tenderness (Fig. 731) will be located.

*Examine the Suspected Area for Evidence of Superficial Oedema.*—In cases of some standing, where there is a subperiosteal abscess, overlying oedema is nearly always present. In this connexion bear in mind Morison's aphorism concerning cellulitis in children (see p. 33).

*Examine Neighbouring Joints for Arthritis.*—It should be noted that in acute osteomyelitis usually a secondary, so-called 'sympathetic', effusion occurs into the nearby joint, e.g., when the upper end of the tibia is infected, there is an effusion into the knee-joint.

*Palpate the Appropriate Lymph-nodes*—for example, those of the groin—and compare with those of the opposite side. They are seldom much enlarged.

The diagnosis of acute osteomyelitis in a patient too ill, or too young, to give any information is one of the most difficult tasks in clinical surgery. Pressure

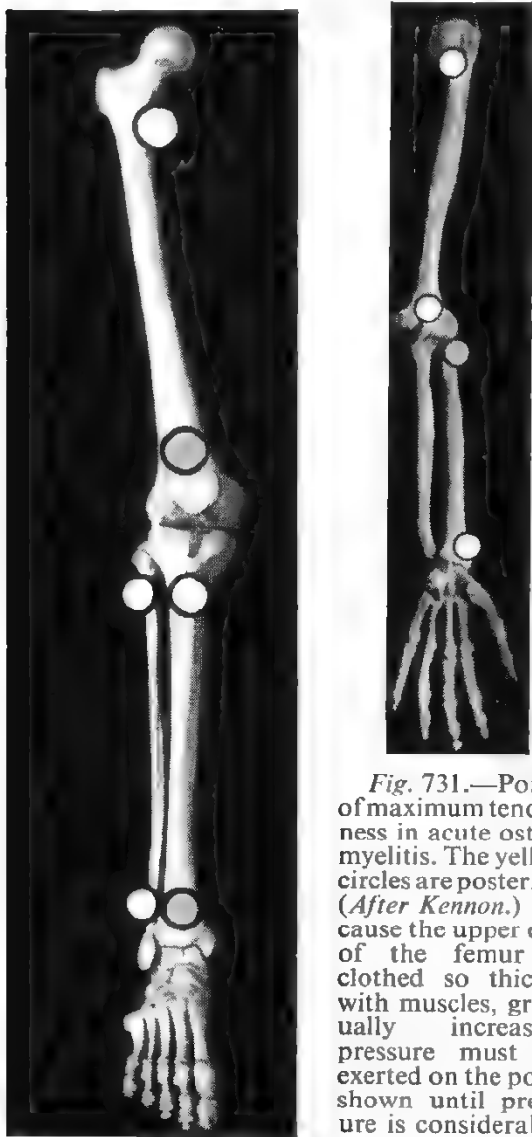


Fig. 731.—Points of maximum tenderness in acute osteomyelitis. The yellow circles are posterior. (After Kennon.) Because the upper end of the femur is clothed so thickly with muscles, gradually increasing pressure must be exerted on the point shown until pressure is considerable.

over commonly affected bones may reveal that one bone is more tender than others. Signs of septicaemia (see p. 45) may be present.

**DIFFERENTIAL DIAGNOSIS OF ACUTE OSTEOMYELITIS.** Apart from other suppurative processes (acute suppurative arthritis, cellulitis) in which the differential diagnosis for the first 24–48 hours is not of such great importance, as antibiotic treatment must be instituted while awaiting definite signs, the *white blood-count* is not greatly raised in the conditions mentioned below. In acute osteomyelitis it is generally raised to 20,000 per c. mm. or more.

*Rheumatic Fever.*—As a rule the pain flits from joint to joint. In a few cases it remains stationary. Although maximum tenderness is situated *at the joint line*, whereas in osteomyelitis it is *near* the joint, in early osteomyelitis good localization of tenderness is uncommon. In rheumatic fever, if tenderness extends beyond the

limits of the joint it does so *both above and below*. In acute osteomyelitis it extends *in one direction only*. Cases of acute osteomyelitis especially difficult to differentiate are when the patient has septicaemia and more than one metaphysis is attacked. In both conditions the temperature is raised but in rheumatic fever the heart is affected and the pulse-rate is raised relatively higher.

*Acute Suppurative Arthritis*.—As noted, in acute osteomyelitis a 'sympathetic' effusion into the joint nearest the affected epiphysis is not unusual. In primary arthritis the infection is *in* the joint; in osteomyelitis it is in the bone *near* the joint. Consequently, when it can be ascertained that one bone only entering into the formation of the joint is tender, the joint signs (effusion) fade into insignificance in the assessment of the signs. Severe pain on attempted movement with distension of the joint capsule and synovial tenderness suggest primary infection of the joint. In the case of sympathetic synovitis, movements of the joint are less painful and the amount of effusion is less.

*Cellulitis* can present a very difficult problem. Deep cellulitis or a subfascial abscess situated over the region of a metaphysis may be impossible to differentiate from acute osteomyelitis. Again, remember Morison's aphorism.



Fig. 732.—Erythema nodosum.

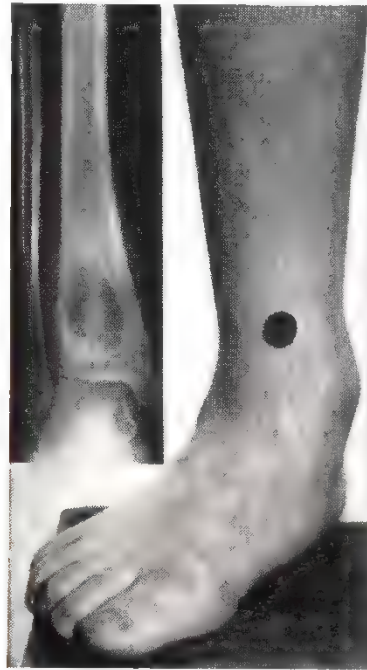


Fig. 733.—Site of maximum tenderness over a Brodie's abscess of lower end of tibia. Inset, radiograph displaying intra-osseous abscess.

*Erythema Nodosum*.—The differential diagnosis is less difficult. If the fingers are passed lightly over the plaques (Fig. 732), it is evident at once that they are raised above the level of the surrounding skin. Each gives the impression of a miniature Table Mountain. Furthermore, if one of these areas is clasped gently between the finger and thumb, it will be found that it can be made to move on the bone.

When a diagnosis of erythema nodosum is reached remember that a fair proportion of patients with sarcoidosis and a few with ulcerative colitis present with this skin lesion and other signs of these diseases should be sought.

*Sickle-cell Anaemia* (see p. 331).—Infarction of bone by blockage of a nutrient artery may



mimic acute osteomyelitis in susceptible subjects. Secondary infection by *salmonella* may occur so that the condition actually becomes one of osteomyelitis.

**Acute Anterior Poliomyelitis.**—The overall picture is rather similar to that of acute osteomyelitis—an ill child with pain and loss of function of a limb. In anterior poliomyelitis the pain and tenderness are spread throughout the main muscular mass (and often more than one muscular mass is involved), whereas in osteomyelitis the tenderness is greatest on direct pressure on the bone. In poliomyelitis, usually the neck is stiff and many of the tendon reflexes are absent.

**Malignant Bone Neoplasm** is often the greatest problem of all, for sarcoma and subacute osteomyelitis can remain indistinguishable for a considerable time. In both conditions, if one waits long enough, there are destructive changes of the bone detected by radiography. Often the only certain proof is on biopsy.

**Acute Osteomyelitis in Infancy** is frequently secondary to umbilical infection. The temperature is often not raised on admission. In an infant, only occasionally does the osteomyelitis manifest itself in the classic manner as regards the general reaction, because at this age the pus is not under pressure; it can readily strip up the periosteum, and soon erodes this veil-like structure. Local oedema comes on much more rapidly, and is much more diffuse than in older patients. In fact, often the whole limb is swollen. Attention is also drawn to acute osteomyelitis of the maxilla (*see* p. 95) caused by pathogens derived from the mother's infected breast. In a breast-fed baby, when acute osteomyelitis of any bone is suspected, the mother's breasts should always be examined for inflammatory changes.

#### DIFFERENTIAL DIAGNOSIS OF ACUTE OSTEOMYELITIS IN INFANCY:—

In infancy the particular difficulties in differential diagnosis are:—

1. *Acute Infective Arthritis*, especially of the hip-joint (*see* p. 509).
2. *Infantile Scurvy*.—The diagnosis is often arrived at in the following manner. The mother says that the child (usually between six months and two years of age) is losing weight and its bones are tender. So tender are the bones that the child looks anxious, and screams at your approach; it knows that if its affected limbs are touched it will be hurt. You gently feel the bones; they feel enlarged because of subperiosteal haemorrhage—you think of syphilis. You now press the gums; they bleed readily\*—you diagnose (correctly) scurvy. Slipped epiphysis is a well-recognized complication of this condition.

3. *Congenital Syphilis*.—*see* p. 430.

### CHRONIC OSTEOMYELITIS

**Brodie's Abscess** is a localized form of infection of the metaphysis of a long bone, caused by a staphylococcus of low, or of attenuated, virulence. The most frequent sites are the lower end of the tibia, the upper end of the tibia, the lower end of the femur, and the upper end of the humerus, in that order. In nearly half of all cases the lower end of the tibia is involved (Brailsford).

The patient most often presents during the second decade of life. In a number of instances there is a history of previous attacks of pain and swelling, followed by long periods of freedom from symptoms. As a rule, the pain is typical of bone pain (worse at night), but in some instances it is worse on walking, and relieved by rest. Often the only sign is deep tenderness over the site of the lesion (*Fig. 733*). In cases where the pain comes on after walking, and in all cases during a severe exacerbation, in addition some swelling, pitting oedema, and perhaps a cutaneous blush are present. In such cases occasionally the adjacent joint becomes swollen

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\* Only if at least some of the deciduous teeth have erupted.

from effusion, but as a rule 'the joint permits of every motion and is apparently normal' (Brodie).

**Osteoid-osteoma** (Jaffe) is a bone condition of unknown aetiology that closely mimics a Brodie's abscess. As a rule the patient is in the second or third decade of life, males being four times as often affected as females.

**Pain** is situated in some part of a long bone (often femur or tibia), not necessarily the metaphyseal region, as is the case with a Brodie's abscess. At first the pain is intermittent but worse at night; later it becomes continuous, and sometimes very severe. The pain is not relieved by rest in bed, but is sometimes relieved by aspirin.

**Tenderness** is localized to a comparatively small, circumscribed area, and if the bone is superficial slight enlargement can sometimes be detected.

**Superficial Oedema** is often present, and slight pitting-on-pressure can be obtained.



Fig. 734.—Chronic osteomyelitis. Recrudescence of infection 16 years after an operation for acute osteomyelitis of the radius.

**Chronic Osteomyelitis occurring remotely after an Operation for Acute Osteomyelitis** is not, strictly speaking, a Brodie's abscess because the latter is chronic from the commencement. The interval between the acute attack and the subsequent development of an abscess is a long one, usually over five years. The signs of inflammation and the presence of a scar (Fig. 734) adherent to some part of the particular bone that is tender make the diagnosis an easy one.

**Sinus Formation following Osteomyelitis.**—This, now relatively infrequent, aftermath of an operation for acute osteomyelitis, or of the spontaneous or designed evacuation of pus from a chronic bone abscess, or the supervention of infection on a fracture (Fig. 735) is a persistent discharging sinus. The reason for the long-continued, often copious, drainage of pus and the failure of the sinus to close is that necrosis of bone is proceeding in the depths of the sinus; in many instances a sequestrum\* is present. Attention has been directed already (see p. 40) to the reliability of exuberant granulation tissue pouting from the mouth of a sinus as a sign of bone necrosis.



Fig. 735.—Sinus following fractured pelvis with extraperitoneal rupture of the bladder.

\* *Sequestrum*. Latin, *sequestrum*, deposit = a piece of dead bone that has become separated from the surrounding live bone during the process of necrosis.

**Syphilis of Bone.**—As a result of early treatment, syphilis of bone has become rare except in parts of the world where medical facilities are poor, but, as of old, it remains the great imitator so that any patient with bone disease (other than obvious acute osteomyelitis) should have a Wassermann blood-test carried out. It presents in several guises:—

**Fleeting Bone Pains.**—Within three years of untreated or incompletely treated syphilis the patient may suffer from pains in long bones, often worse at night, and boring in character.

**Gumma of a Long Bone** can simulate, among other conditions, a giant-cell tumour, an eosinophilic granuloma, an Ewing's tumour, and metastatic carcinoma for which the primary growth cannot be discovered. Biopsy will settle the issue if it is felt that the positive Wassermann reaction may be coincidental.

**Syphilitic Osteoperiostitis** occurs late in the course of the disease (i.e., after the three-year period referred to above). Usually one bone (less often bilateral symmetrical bones) is attacked, in which event the bone becomes painful, tender, and the seat of a spindle-shaped enlargement. The whole of the affected bone becomes sclerosed. Often the bone gives an illusion of being bent, because new bone is deposited beneath the periosteum of the anterior aspect of the bone—to take a leading example, *sabre tibia* (Fig. 736).

**Syphilitic Metaphysitis** is a variety of the above occurring in untreated congenital syphilitics; the swelling and tenderness is at the bone-ends.

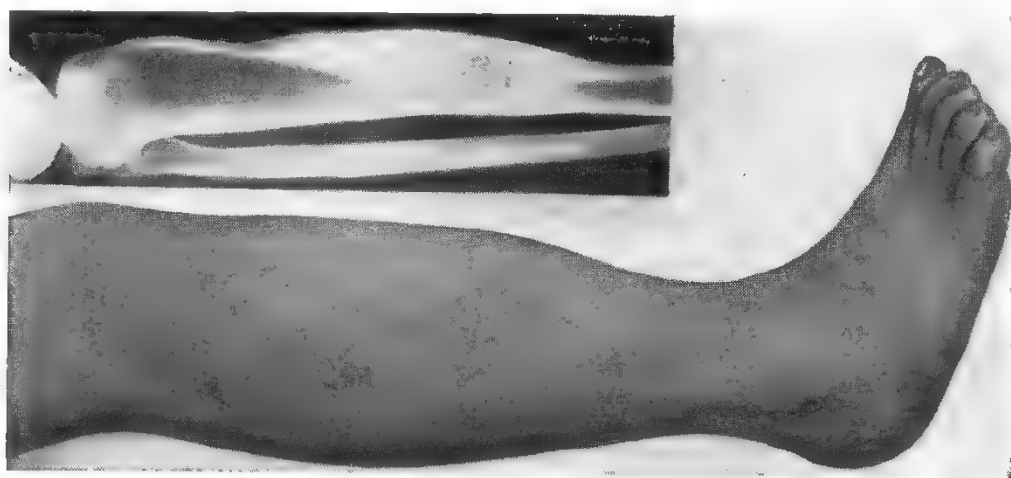



Fig. 736.—Sabre tibia. Compare with Fig. 745.

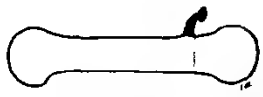
### A SWELLING OF BONE: DIFFERENTIAL DIAGNOSIS


**General Considerations.**—Ascertain by palpation whether the swelling springs from one aspect of the bone, or whether the whole circumference participates in the swelling. In the case of the former try to move the swelling on the bone to make sure that it is intimately attached.

Another basic principle is that when a bone has been examined, movements of related joints should be tested, but first, no matter how insultingly elementary it strikes the reader, the integrity of the bone itself must be tested. Unless it moves in one piece, there is a fracture which may be spontaneous, consequent upon rarefaction due to the swelling; it is also possible that the swelling is composed of excessive callus consequent upon a traumatic fracture or consists of calcification in muscles—*myositis ossificans*.


Having ascertained these points, and having regard to the varied nature of swellings of bone, it is well to have in mind a hypothetical bone with a shaft and two extremities, and to refresh the mind on the locations of the principal causes of local enlargement of the bone.

If the swelling envelops the whole circumference and is situated at one end of the bone, so as to further expand the bulbous extremity, viz. —————→ 

If the swelling is situated on one aspect only of the periphery, and located at or very near the epiphysial line, or where the epiphysial line was before growth had ceased, viz. —————→ 

When the swelling expands the bone, and is situated in the neighbourhood of the metaphysis, viz. —————→ 

the difficulty of solving the problem increases in complexity. Brodie's abscess, simple bone cyst, and, above all, an osteosarcoma must each be weighed in the diagnostic balance.

When the swelling expands the bone and is situated more nearly midway between the two bone-ends, viz. —————→ 

Ewing's sarcoma and eosinophilic granuloma must receive prior consideration.

The physical characteristics of each of these various swellings will be found commencing below. Radiographic assistance is essential but in many instances biopsy is indispensable for completing a diagnosis *which may lead to a decision to amputate the limb.*

The ease or difficulty with which a bone is examined clinically depends, to a large extent, upon whether the bone is superficial. The superficial aspects of the tibia, ulna, patella, clavicle, and skull are readily palpable, but palpation of bones well covered with muscles is extremely difficult. In the latter situations every effort should be made to get the muscles relaxed by attention to the posture. For example, *Fig. 737* shows the position adopted to relax the gluteus maximus in order that a swelling beneath that muscle might be palpated. In this position it became evident that the swelling in question was attached to the ischial tuberosity.

In answering the all-important question, 'benign or malignant?', the following table may prove helpful:—

BENIGN	MALIGNANT
Swelling often large Painless Local temperature normal Slow growth	Bone not greatly enlarged Often painful Warm to touch Rapid growth or recent enlargement of long-standing swelling

### BENIGN NEOPLASMS

**Solitary Bone Cyst** is the commonest benign neoplasm. It is due to disordered growth at the epiphysis, the swelling appearing in the metaphysis. It is sometimes large enough to be noticed as a swelling but usually presents in childhood as a spontaneous fracture, the fact that a cyst is the cause being noticed on radiology.

**Osteoma.**—See p. 56.

**Solitary Diaphysial Exostosis** is also a common skeletal neoplasm. It appears only in bones preformed in cartilage, and is most likely to be found on the

juxta-epiphysial area of a long bone. It is capped by cartilage, which in turn is sometimes surmounted by an adventitious bursa. In approximately one-half of all cases the exostosis is located at the lower metaphysis of the femur, or the upper metaphysis of the tibia.

*The Sign of a Diaphysial Exostosis.*—Pass the fingers firmly down the side of the bone in such a way as to allow them to ride over the swelling. In the case of a diaphysial exostosis, the side farther away from the joint is overhanging (Fig.738).



Fig. 737.—Palpating a lump beneath the gluteus maximus. Position adopted in order to ensure muscular relaxation. Inset—Radiograph of the case. Calcification in the bursa overlying the ischial tuberosity.

**Hereditary Multiple Diaphysial Exostoses (Diaphysial Aclasis\*)** is not rare. About half the offspring of an affected individual manifest the condition, males predominating 7 : 3. The multiple exostoses, similar to the above, become noticeable during childhood. In addition, during adoles-

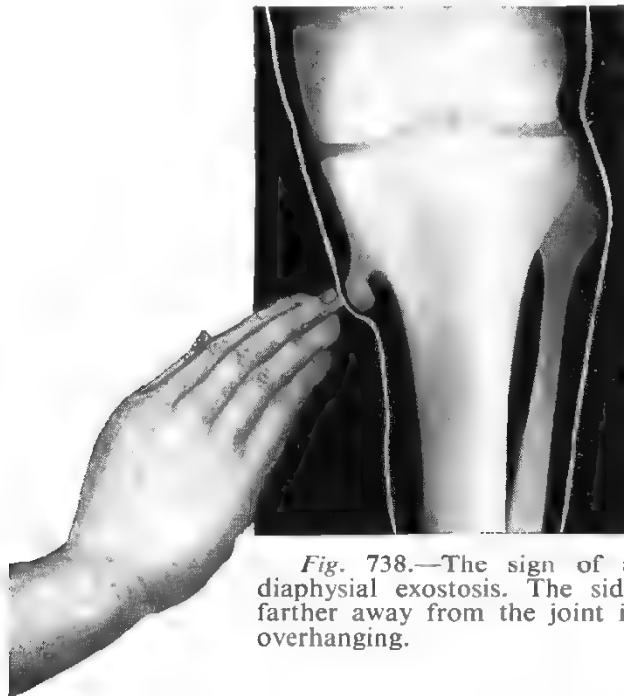


Fig. 738.—The sign of a diaphysial exostosis. The side farther away from the joint is overhanging.

\* *Aclasis*. Greek,  $\alpha$  = not +  $\kappaλάσις$  = breaking. Morbid continuity of structures. The outgrowth is structurally similar to tissues from which it springs.



cence, not infrequently it becomes apparent that the patient has bowing of one or both forearms with ulnar deviation of the hand. Subjects of this condition are usually short of stature.

**Aneurysmal Bone Cyst.**—This expands the bone and the resultant swelling may be confused with giant-cell tumour (*see below*) but tends to involve the bones of the trunk rather than the limbs. The distinctive sign is that a systolic murmur often can be heard on auscultation of the swelling owing to its extreme vascularity.

**Multiple Enchondromata.**—*See p. 437.*

## MALIGNANT NEOPLASMS

### PRIMARY

**Multiple Myeloma** is invariably fatal and not uncommon. Although it can occur at almost any age, as a rule it is found between 50 and 70 years with a male preponderance. The most characteristic early symptom is bone pain of gradual onset often in the back and thoracic cage. It is made worse by movements, coughing or sneezing. To intractable bone pain is, towards the end, added the torment of spinal root pain from collapse of a vertebra. Sometimes one of the tumours becomes large enough to be palpable, in which event the swelling feels firm, rubbery, and is rather tender. The location of tumours that can be felt or seen is headed by a rib or the skull (*Fig. 739*); the next in order of frequency is a clavicle



*Fig. 739.*—Multiple myeloma has a predilection for the bones of the trunk. When one of the tumours is situated in a rib or in the skull (as in this case) it may become visible.



*Fig. 740.*—Advanced giant-cell tumour of the lower end of the femur causing expansion of the bone.

or the sternum. Spontaneous (pathological) fracture occurs frequently, more often in a vertebra than elsewhere. In half of cases the urine is loaded with albumin and contains Bence Jones protein. As the disease advances, general lymphadenopathy, together with enlargement of the liver and spleen, is usual. An invariable finding even in early cases is anaemia. A few patients suffer from a bleeding tendency, and attend first with epistaxis, bleeding gums, haemoptysis, or haematemesis.

**Giant-cell Tumour** (osteoclastoma) occurs generally between 20 and 40 years, males and females being attacked equally. In 50 per cent of cases the tumour occurs in the region of the knee-joint (*Fig. 740*). As a rule the pain is not severe. Increased

local heat and dilatation of superficial veins is suggestive of an aggressive tumour. Pulsation and egg-shell crackling are very late signs, and are now seldom seen. This neoplasm is locally malignant, frequently recurs after local removal, and may even metastasize.



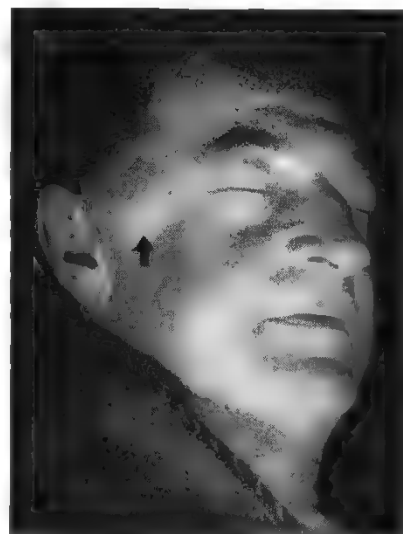
Fig. 741.—Ewing's sarcoma.

**Osteosarcoma.**—Most of these tumours occur in patients between 10 and 20 years of age, and have a male:female ratio of 1.6:1. In elderly subjects osteosarcomata occur in bones the seat of Paget's disease. The lower end of the femur, the upper end of the tibia, and the upper end of the humerus are the bones attacked most frequently, in that order. The earliest symptom is pain, and this is often present for some time before there is an obvious swelling: like all bone pain, it is worse at night. When a swelling becomes apparent, the limb in the region of the swelling is wont to exhibit increased warmth, and this is liable to veer the inexperienced clinician's thoughts to an inflammatory lesion whereas, in this instance, the sign of increased heat should not bias him. Pulmonary metastases occur regularly and comparatively early; they are sometimes present when the patient first attends.

**Reticulum-cell Sarcoma\*** (Ewing's Tumour).—Most of the patients are adolescents, and the tumour is more common in males. The shafts of the femur (Fig. 741) and the long bones are the most common sites. The swelling feels warm but its situation suggests that this is not an ordinary osteomyelitis. In some patients there is pyrexia, in which event the tumour is very malignant. The rapid response to radiotherapy is a therapeutic test.

**Eosinophilic Granuloma** is a benign bone lesion that simulates an Ewing's sarcoma in some respects, but tends to involve the skull and trunk bones more frequently, and does not cause enlargement of the affected bone to such an extent. A reliable differential diagnosis is only possible with biopsy.

Fig. 742.—This slightly painful swelling connected with the zygomatic arch is the patient's only complaint. On examination it is intimately blended with the malar bone, and, although it feels hard, there is an area of softening in the centre. On interrogation he admits to slight dysuria and some increased frequency of micturition. Rectal examination reveals a hard, grossly irregular prostatic enlargement. Diagnosis—secondary carcinoma from the prostate.



**Chondrosarcoma.**—Many chondrosarcomata have their origin in a pre-existing chondroma. The pelvis is the commonest site, and about 75 per cent of all the tumours are situated in the trunk or the upper end of the femur or humerus. The pain is less severe than in osteosarcoma, and it is often a year before the patient seeks advice. Metastasis occurs comparatively late.

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\* A similar tumour often proves to be a secondary deposit from an adrenal neuroblastoma.

## SECONDARY

Before expressing an opinion on a swelling of a bone one must ask the important question 'Is this swelling primary or secondary?' (*see Fig. 49, p. 25*). Too often this is not heeded; it is taken for granted that the skeletal lesion is a primary tumour. Consequently the general examination of the patient is perfunctory, and it fails to reveal a primary growth, even though the latter might have been discovered easily.

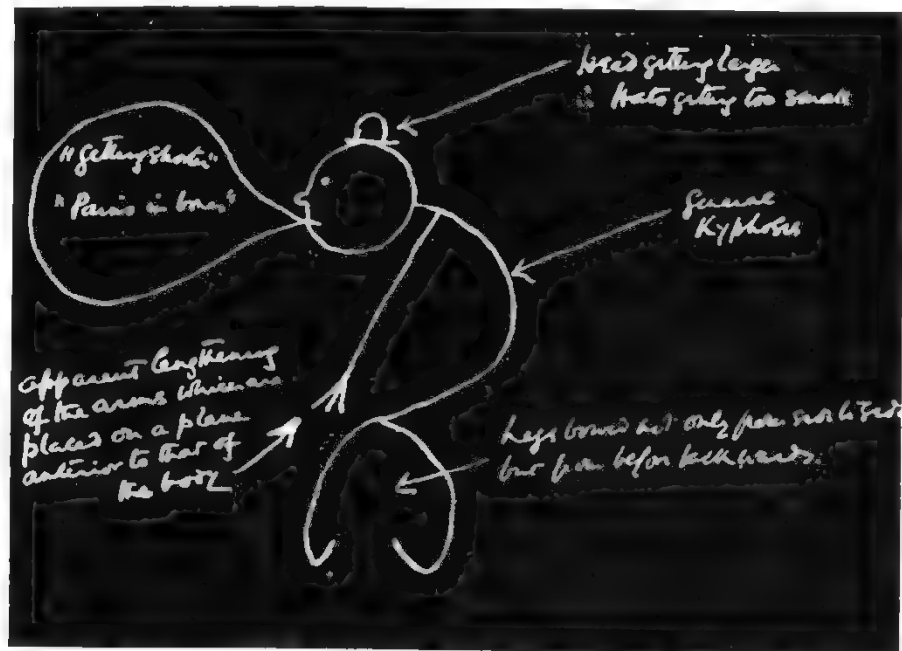
**Metastatic Carcinoma** is by far the most common malignant bone tumour, particularly after adolescence. Often a metastatic lesion is the presenting complaint, the primary being clinically silent. The breast, the bronchus (*see Fig. 153, p. 78*), the thyroid, the prostate (*Fig. 742*), and the kidney are the organs upon which to concentrate in the search for a primary growth. A reticulosis not uncommonly is responsible for a localized bone deposit.

## GENERALIZED BONE DISEASE

**Paget's Disease of Bone** (Osteitis Deformans) which, with the lengthening span of life, is common, occurs more frequently in men. This disease, the cause of which as yet is unknown, presents in two forms: (1) Generalized (*Fig. 743*); (2) Localized to one bone.



*Fig. 743.*—Paget's disease of bone. Generalized variety.



*Fig. 744.*—Diagram of the essential signs of Paget's disease of bone.

**1. Generalized Variety.**—'Begins in middle life or later, is very slow in progress, and may continue for many years without influence on the general health. It affects most frequently the long bones of the lower extremity and the skull, and is usually symmetrical. Even when the skull is hugely thickened and all its bones

extensively altered in structure, the mind remains unaffected.' So wrote Paget. All the leading clinical features are summarized in the accompanying diagram (Fig. 744).

As a rule, so very slowly progressive is the disease that although the patient suffers from bone pains, and especially from backache, more often than not these symptoms are attributed to 'rheumatics' or to 'old age coming on'. In a minority of cases the patient complains of headache, deafness, or vertigo, or occasionally failing vision, due respectively to compression of the cerebrum and constriction of cranial nerves at their exit from the skull.

**COMPLICATIONS. Cardiac Failure.**—The enlarged bones are very vascular—indeed on occasion they behave as an arteriovenous shunt, and cause cardiac decompensation.

**Spontaneous (Pathological) Fracture**, especially of the upper femur or upper tibia, is probably the most common complication for, although the bones are thicker than normal, they are very brittle. Typically, the fracture is a transverse one, and although it unites readily, refracture is not unusual (Lake).

**Supervention of Sarcoma\***.—Increased pain with incontestable *recent* enlargement of one bone more than its fellow, together with increased warmth in the overlying skin, makes the diagnosis of bone sarcoma one on which faith can be pinned. This complication occurs in about 3 per cent of cases.

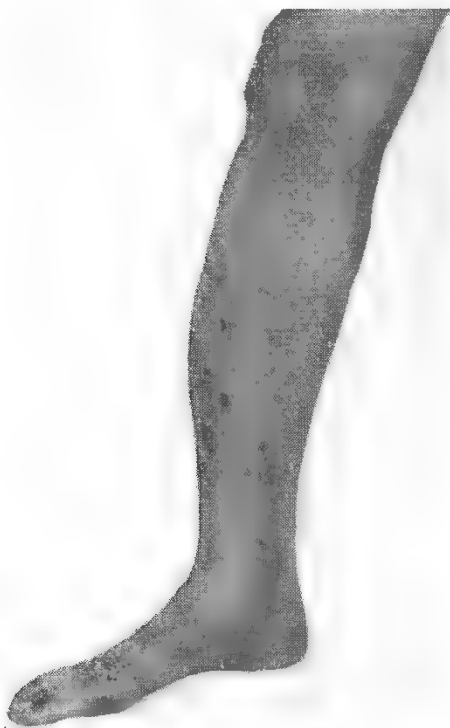


Fig. 745.—Paget's disease involving the tibia only. Note that the bone is actually bent; cf. sabre tibia, Fig. 736.



Fig. 746. Multiple enchondromata in a labourer aged 38. Swellings which were present on both hands had been growing slowly larger since early adolescence.

**Spinal Cord or Cauda Equina Compression.**—Slow progressive narrowing of the vertebral canal by bone proliferation causes neurological signs (see p. 226).

**2. Monostotic Paget's Disease.**—A single bone, usually a tibia (Fig. 745) or femur, but never a fibula, alone is affected—at least for many years. If there is doubt as to the diagnosis, the serum alkaline phosphatase estimation is usually raised (this applies to both varieties of Paget's disease). In 75 per cent of cases eventually the generalized form supervenes.

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\* Paget's original patient died of this complication 22 years after first being seen.

**Osteitis Fibrosa Cystica** (von Recklinghausen's Disease of Bone) is a relatively rare manifestation of hyperparathyroidism, occurring in 28 per cent of cases of parathyroid adenoma (McGregor). Recurrent renal calculi is the more usual presentation. Signs and symptoms referable to the skeleton can become manifest at almost any time of life, but they do so most frequently during the second decade. Women are affected more often than men. Often the first symptoms are muscle weakness, gastro-intestinal upsets, and muscle pains. The muscle weakness is especially noticeable in the facial muscles, and is often mistaken for myasthenia gravis (*see* p. 90). Cystic degeneration scattered widely throughout the skeleton (but particularly in the mandible) is demonstrable radiographically before it is apparent clinically. Pain in bones, bending of bones, fractures, and possibly localized expansion of one or more bones are the skeletal manifestations.

A suspicion of osteitis fibrosa cystica demands that attention should be directed to the thyroid, which should be palpated thoroughly for the presence of a parathyroid tumour (*see* p. 163) but as a rule the tumour is too small, or too deeply placed, to be palpable. In most instances *the* key to the diagnosis is the finding of an elevated serum calcium level.

**Polyostotic Fibrous Dysplasia** is similar in as far as the bone and X-ray features are concerned but there is no parathyroid disease or raised serum calcium. A single limb may be affected. The aetiology is not known.

**Albright's Syndrome** — polyostotic fibrous dysplasia + precocious puberty + *café au lait* skin patches.

**Multiple Enchondromata** (Dyschondroplasia, Ollier's Disease).—In this congenital condition cartilage persists in the shafts of long bones and forms multiple tumours, particularly in the hands (*Fig. 746*). When a major long bone, e.g., femur, is affected the whole limb is shortened and deformed.

## DWARFISM

Many varieties of generalized bone disease present at birth or arising in infancy and childhood cause stunted growth. Most of these are of interest to paediatricians rather than surgeons, e.g., rickets, or are of great rarity. The following conditions are not so uncommon.

**Achondroplasia** produces the most common variety of dwarfism and is congenital; sometimes it is familial. Achondroplasiacs are seen performing on the stage, screen, and in circuses, and they can be observed in the street surprisingly often in some European towns. Subjects have normal intelligence, usually excellent musculature, and prominent buttocks. The skull is large with bulging frontal bosses; the nose is flat. The trunk, though somewhat short, is relatively normal compared with the arms and legs. With the arms hanging by the sides, the hands reach only to the level of the upper thighs. In normal individuals the umbilicus is situated above the centre of a line extending from the top of the vertex to the soles of the feet; in achondroplasia alone, due to the relative shortness of the legs, the umbilicus is situated below this centre point (*Fig. 747*).

**Morquio's Disease** (Osteochondrodystrophy).—The subject has short limbs as has an achondroplasiac, but wedged vertebrae causing kyphosis (*see* p. 208) are additional.

**Renal Dwarfism**.—Rickets caused by deficiency of vitamin D has almost disappeared. Partly for this reason, more attention is being focused on conditions due to renal or intestinal disease (renal or coeliac rickets). Parents seek advice about the child because of (a) retardation of growth; (b) bone pains; (c) mild skeletal deformity, notably genu valgum; and (d) hypocalcaemic con-

FRIEDRICH D. VON RECKLINGHAUSEN, 1833–1910, *Professor of Pathology, Strasbourg.*  
 ALEXANDER L. MCGREGOR, 1895–1969, *Senior Consultant Surgeon, General Hospital, Johannesburg.*  
 FULLER ALBRIGHT, 1900–1969, *Professor of Medicine, Harvard University, Boston, Mass.*  
 LOUIS OLLIER, 1830–1900, *Professor of Surgery, Lyons, France.*  
 LUIS MORQUIO, 1867–1935, *Uruguayan Physician.*



vulsions. Coeliac disease is of medical importance but renal rickets is of especial surgical interest because not a few are consequent upon congenital urinary obstruction. In this instance the child is found to have an overfull bladder (*Fig. 748*) due to atresia meati, congenital valves of the posterior urethra, or median bar obstruction of the vesical outlet. Therefore *the first duty is to seek an overfull bladder*, and if such is present, to pursue the cause until it has been found. A larger group of cases is renal in origin so a full examination of the urinary organs is necessary (*see Chapter XXIV*).



*Fig. 747.* Achondroplasia. Normally the umbilicus lies above the middle line of the body. In achondroplasia it is regularly below the middle line.



*Fig. 748.*—Renal dwarfism. Note the overfull bladder.

#### SOME OTHER CONGENITAL CONDITIONS

There are a large number of syndromes of great rarity, descriptions of which will be found in monographs on bone disease or radiology. The following are of sufficient frequency and exhibit interesting physical signs to concern us here.

**Fragilitas Ossium** (Osteogenesis Imperfecta) is a congenital, sometimes hereditary, skeletal disease in which the bones are extremely brittle. A particularly arresting feature of the condition is that many of these patients have china-blue sclerotics (*Fig. 749*); indeed, 60 per cent of adult patients with blue sclerotics\* suffer from fragilitas ossium. The blueness of the sclerotics is due to their decreased opacity, which permits the pigment of the deeper coats to show through. Both the fragility of the bones and the relative translucency of the sclera are due to lack of part of their proper matrix.

This disease is encountered in two forms:—

*a. That becoming manifest in Early Infancy.*—From birth, or soon afterwards, frequent and often multiple fractures occur. Although the infant has blue sclerotics, this is not such a helpful sign as it is later in life, because normal babies show such a blue tinge. The skull shows parietal prominences and an occipital bulging; the sutures of the cranial bones are late in closing, and soft areas in abnormal situations are not unusual. The lower limbs are stunted. With every bone liable to break on the least provocation, it cannot be wondered at that the infant's chances of survival are seriously curtailed.

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\* A grossly premature arcus senilis (*see p. 5*) occurs in some patients with blue sclerotics.

*That becoming manifest in Childhood or Later.*—The child is normal at birth. The frequency with which fractures occur varies; the longer the occurrence of the first fracture is delayed, the fewer the subsequent episodes. Usually, but not always, the fracture unites readily. An occasional unfavourable feature is that the fracture (usually of the femur) unites with so much callus as to form a palpable, or even a visible, swelling.

Many of these patients have hypermobility of joints, the texture of their skin is fine, their teeth are extremely defective because of imperfect calcification of dental enamel; 60 per cent of them become increasingly deaf from otosclerosis. All are short, due sometimes to kyphoscoliosis (*see* p. 208).

**Ochronosis**,\* if looked for, is easily recognized, which is important as treatment is possible. Although the condition can arise from carbolic acid poisoning, all other cases are congenital, and are due to an inborn error of metabolism of tyrosine and phenylalanine. This results in alkaptonuria.

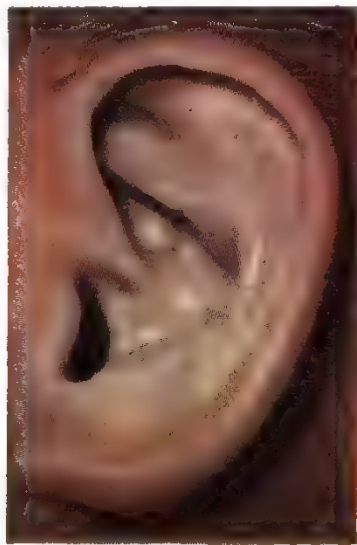
*Alkaptonuria* should be suspected in infancy because of black discoloration of the diapers. Frequently it goes unrecognized until later in life, when for one reason or another the urine is tested for sugar. As alkapton causes a reduction of the reagents commonly employed for the detection of sugar in the urine, it is more than likely that the patient will be considered to be a diabetic. When first voided, the urine is of normal colour, which then passes through slate-blue to brown, and finally to black, on standing (*Fig. 750 A*).



*Fig. 749.*—The blue sclerotics of fragilitas ossium. During the past five years the boy had been admitted to hospital for fractures on many occasions.



A



B



C

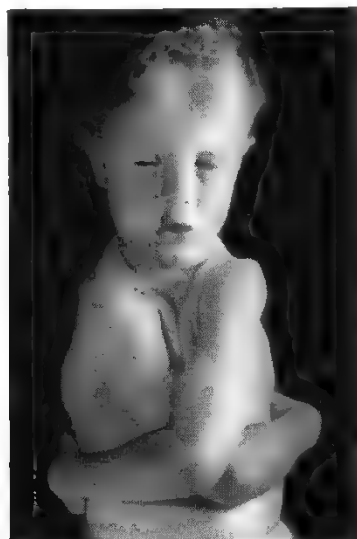
*Fig. 750.*—Ochronosis. A, Urine standing overnight; B, Pigmentation of auricular cartilage; C, Scleral pigmentation.

By the time the patient reaches early middle life, sufficient pigment has been deposited to give rise: (1) to visible bluish discoloration of the auricular cartilages (*Fig. 750 B*); (2) to circumscribed patches of light brown or slate-blue discoloration of the sclerotics on either side of the corneal limbus (*Fig. 750 C*); and (3) to discoloration of the skin over bony prominences. Often there is similar discoloration beneath the finger-nails and the perspiration is dark brown (Rose). The patient suffers from generalized arthritis (ochronotic arthritis) which in 50 per cent of cases

\* *Ochronosis*. Greek, *ὀχρός* = yellow, *νόσος* = disease. When first deposited, the pigment is yellow; later it turns grey-black.

becomes severe and is especially evident in the spine. Owing to degeneration of the pigment-laden intervertebral disks, the patient's vertebral column becomes kyphotic and rigid, resulting in a deformity of the spine reminiscent of the curvature produced by Paget's disease of bone. General osteoporosis also occurs, and these patients are subject to fractures as a result of minor injuries.

**Cranio-cleido-dysostosis.**—The remarkable feature of this rare hereditary abnormality is the congenital absence of one or both clavicles (*Fig. 751*). Examine for the following additional abnormalities:—



*Fig. 751.*—Cranio-cleido-dysostosis. The shoulders can be almost approximated when the patient hunches the shoulders and crosses the arms.

**Skull.**—Owing to the sagging of the bones of the vault, the cranium presents a flattened appearance. Delayed closure of the fontanelles is usual.

**Teeth.**—The permanent teeth remain unerupted until middle life. The wearing of artificial dentures seems to stimulate eruption, probably from absorption of the overlying bone. Un-erupted and incompletely erupted teeth are prone to give rise respectively to cysts or abscesses.

**Spine and Pelvis.**—Frequently accentuation of the normal curves is present, and gives rise to lordosis, kyphosis, or scoliosis.

**Lower Extremities.**—The femoral necks are frequently deformed or absent, and coxa vara is a common abnormality.

## CHAPTER XXIX

## SUSPECTED FRACTURES: EXAMINATION OF JOINTS

## FRACTURES

ROENTGEN'S epoch-making discovery was of inestimable value in the diagnosis of fractures and dislocations, but in some situations it is inferior to careful physical examination. Radiographs purporting to reveal an early fracture can be misleading; unless an end of the bone is jutting out through the skin, they fail to signify whether the fracture is closed or open (compound); not infrequently they fail to show a fracture of the base of the skull; they may fail to show a fracture of the carpal scaphoid (*see* p. 476), a recent march fracture (*see* p. 563), or other stress fracture. In a fractured long bone the crack is sometimes so fine that for a number of days after the injury it cannot be distinguished radiologically from the normal lines of separation of trabeculae. On the other hand, they often reveal a fissured fracture that might otherwise have been diagnosed as a sprain, and also an impacted fracture that might have been overlooked.

Amidst these complexities there has emerged a powerful searchlight focused on the witness-box. In the eyes of the Judiciary the diagnosis of a fracture and an X-ray examination are linked so inseparably that 'No X-ray — negligence!' So it comes about that more than once a practitioner without facilities for radiography at night has sent a patient with an open fracture elsewhere for X-ray examination. In his anxiety to avoid litigation he has failed to notice that the fracture was compound.

**The Diagnosis of a Recent Fracture by Physical Signs.**—First the injured part must be exposed: severing overlying garments with scissors or slitting a seam with a scalpel is often necessary. This must be carried out with the utmost care and gentleness. Even so, the modicum of movement thus entailed is sometimes sufficient, inadvertently, to call attention to two unfailing signs of complete fracture—*abnormal movement* and *crepitus*—the deliberate elicitation of either of which, for fear of inflicting further damage as well as excruciating pain, is forbidden absolutely.

Three important features of a fracture, *pain*, *swelling*, and *bruising* can be present with lesser injuries. The following signs are only found with a fracture or dislocation.

**Loss of Function.**—Unlike a sprain or a bruise of soft tissues, a fracture usually renders the part almost functionless. To a great extent this is voluntary, for (fractured rib excepted) the patient keeps the fragments strictly at rest. For instance, in the case of a fractured humerus the patient grasps the wrist to prevent movement of the ends of the broken bone, for he has found that such movement causes an exacerbation of exquisite pain.

**Deformity** (*see* p. 22) is noted. For instance, when an elderly patient falls, and complains of pain in the hip, slight external rotational posture of the limb is a sign so characteristic as to warrant the making of a confident diagnosis of fracture of the neck of the femur.

Unless deformity is obvious, time should be spent in comparing the position and contour of the injured part with that of the opposite side of the body, at first by sight, then by palpation, and finally, if necessary, by measurement.

All grades of deformity are encountered. Sometimes it is extravagant, as in

the case of a fractured clavicle, the shaft of the humerus (*Fig. 752*), and the middle third of the femur; at others it is slight; often it is absent, as in fractured rib.

Having concluded the inspection, the flexor surfaces of the fingers are passed lightly over the entire available area overlying the bone suspected of being fractured. Even with a bone well clothed by muscle, an abrupt angular deformity that was not visible because of swelling of the soft parts sometimes can be felt.



*Fig. 752.*—Deformity produced by a complete fracture at the junction of the upper and middle thirds of the humerus.



*Fig. 753.*—Testing for a point of localized tenderness in the case of a bone with a subcutaneous surface.

**Localized Bone Tenderness.**—Persistent tenderness localized over one part of the bone is an extremely valuable sign; it is the principal sign of impacted and greenstick fractures; usually it is the only sign of a crack fracture. If the bone has a subcutaneous surface or border, the pulp of the index finger is passed along its whole length (*Fig. 753*), exercising moderate pressure, and the patient's face is watched. When the bone in question is placed more deeply, systematic deep palpation is carried out, thus achieving the same objective. Should one place be found to be particularly sensitive, it is presumptive evidence that this is the site of a fracture.

**Shortening.**—Details of the method of measuring individual long bones are given on pp. 462 and 505.

**Shock** is an inconstant finding; it depends largely on the amount of blood lost into the tissues and externally (*see p. 569*).

**Inconstant Later Signs. Fracture Blisters.**—Undiagnosed or treated inadequately, a fracture often proclaims itself by the appearance of cutaneous blebs containing serum or blood-stained serum (*Fig. 754*) which appear 3–5 days after the injury when the skin is unsupported by a pressure dressing. Such blebs are seen most commonly with a fracture of the lower limb below the level of the knee-joint. In relevant circumstances they must be distinguished from the blisters of burns or scalds, and those of impending gangrene.



*Ecchymosis.*—Cutaneous bruising causes some discoloration at the site of injury within 2 or 3 hours, and within 12 hours the discoloration reaches its zenith. Similar discoloration (depending on the distance the extravasated blood has to travel) coming to the surface 3–10 days after the injury, and possibly some distance from the site of the injury, is strongly suspicious of a fracture.



Fig. 754.—Fracture blisters.

*Swelling due to Callus.*—Callus takes some time to form. In some cases of greenstick fracture, particularly of a subcutaneous bone, the mother may first bring her child for advice because she has noticed a swelling (Fig. 755) long after the accident.

#### **Atypical Types of Fracture.**

*Greenstick Fracture* is relatively painless as the fracture is incomplete, no movement between the bone-ends taking place. For this reason loss of function is not greatly evident. It occurs in children, most commonly in the forearm.

*Separated Epiphysis.*—The injury occurs in an adolescent, before the epiphysis is united to the shaft of the bone. There is nothing to distinguish a separated epiphysis from a fracture clinically except the age of the patient.

*Impacted Fracture.*—The lower end of the radius and the necks of the femur and humerus are the most common sites. The broken ends of the bone being driven into one another, movement between them is impossible. Consequently such fractures are frequently almost painless. Thus the patient who has sustained a Colles's fracture (see Fig. 808, p. 476) is likely to dismiss the injury as a sprain. Similarly, a patient with an impacted (abduction) fracture of the neck of the femur can even manage to walk, but usually only after a few days' rest. There is alteration in the contour and length of the limb, the affected bone being shorter. The signal importance of local tenderness in this type of fracture has been emphasized already.

*Spontaneous or Pathological Fracture* signifies a fracture from violence that

would be insufficient to break a normal bone. The most common cause is rarefaction of the bone due to a secondary neoplasm. When confronted with a fracture following a trivial injury, do not fail to examine the breasts, the thyroid gland, the kidneys, the testes, and the prostate for a primary growth. If these feel normal, think of primary carcinoma of the bronchus. Spontaneous fractures also occur in Paget's disease of bone (*see* p. 435) and in fragilitas ossium (*see* p. 438).



Fig. 755.—Excessive deposit of callus around a greenstick fracture of the right clavicle.



Fig. 756.—The petechial rash of fat embolism.

**Fat Embolism** is an uncommon, but most serious, complication of a fracture. Usually the symptoms arise between 36 and 48 hours after the accident. *Second hour—shock, second day—fat embolism, second week—pulmonary embolism* is a wise axiom that warns the clinician of possible impending systemic complications of a closed major fracture.

The signs and symptoms arise suddenly. The patient becomes restless and complains of indefinite pain in the chest. If seen during this fleeting stage, he will be observed to be cyanotic. In a matter of minutes cerebral symptoms supervene. Should the fat globules released into the circulation be large or numerous, their lodgement in the cerebral vessels will cause unconsciousness, in which event the prognosis is grave. More often fewer small fat globules enter the circulation, and drowsiness is produced.

1. *Drowsiness accompanied by Retention of Urine* occurring in a comparatively young patient two or three days after a fracture has been sustained is good presumptive evidence of fat embolism. The pupils are contracted.

2. *Temperature* becomes elevated; in a patient who is going to recover the temperature soon falls, but a second, similar rise the following day is usual. After that only moderate rises occur for several days.

3. *Rash*.—A petechial rash is most in evidence on the upper part of the chest, neck, and shoulders (Fig. 756). Occasionally subconjunctival petechiae are present as well. The cutaneous spots are brightest when they just appear; within two days they fade, but are still visible for several days (Alldred).

4. *Thoracic Signs*.—There is considerable, slightly purulent expectoration, which is never blood-stained.

5. *Central Nervous System*.—In the absence of coma the signs of central nervous involvement are extremely variable, depending upon which part of the brain is mainly involved, and to what extent. In mild cases the signs are few and transitory.

6. *The Sputum and Urine should be inspected for Fat Globules* which, however, are seldom present.

**Diagnosis of Dislocations.**—An X-ray is essential for the reasons mentioned in the introductory paragraphs to this chapter, but an accurate diagnosis by clinical means is easily made, as with a fracture. The signs are more or less those of a fracture which may, indeed, be present as well (particularly of the surgical neck of the humerus associated with a dislocated shoulder). There are two points of difference: firstly, the injury is manifestly at the end of a bone; secondly, the bone-end may be seen or felt in an abnormal position (dislocated shoulder, see p. 457).

Crepitus is not present when there is a dislocation without fracture. For the reasons mentioned above, this point is of no practical importance.

### ROUTINE EXAMINATION OF A JOINT

When a joint becomes inflamed it takes up the position of greatest ease, which is, in fact, the position of greatest capacity for that joint because of the increased amount of synovial fluid secreted. Thus the following are the leading signs of arthritis:—

JOINT	POSITION OF GREATEST EASE	SITE OF MAXIMUM SWELLING
Shoulder	Slight adduction	Under the deltoid, along the tendon of the biceps, and in the axilla
Elbow	Flexed at a right-angle; forearm pronated	On either side of triceps tendon
Wrist	Slight flexion	Under extensor and flexor tendons
Hip	Partially flexed, abducted, and externally rotated ( <i>Fig. 757</i> )	Upper part of the femoral triangle
Knee	Semiflexion ( <i>Fig. 758</i> )	Suprapatellar pouch, and either side of patellar tendon
Ankle	Slight plantar flexion and inversion	Anteriorly, and on either side of the tendo Achillis*

Having studied the position in which the affected joint is held, continue thus: —

*Compare the Joint with that of the Opposite Side.*—The joint may be obviously larger than its fellow, but wasting of adjacent musculature can exaggerate the discrepancy. Enlargement may be due to fluid in the joint (fluctuation, see p. 11), or to synovial thickening (see below), or to both.

*Wasting of Muscles that move the Joint.*—See that sufficient of the patient's anatomy is displayed to enable you to compare the limbs with special reference to muscular symmetry. When a joint is inflamed, wasting of neighbouring muscles occurs, even after a comparatively short time, e.g., a week or ten days. Such wasting affects certain groups of muscles in a constant and characteristic distribution; for instance, the quadriceps when the knee-joint is involved (*Fig. 758*), and the deltoid in the case of the shoulder. Minor degrees of muscular wasting can be determined only by taking accurate measurements of the girths of the limbs at identical levels (see *Fig. 864*, p. 504).

\* Achilles, when an infant, was dipped into the river Styx to render him invulnerable. Thenceforth he remained unprotected only in the heel by which he was held (Greek mythology).



*The Pointing Test.*—If pain is a leading symptom, ask the patient to point with one finger to the site of the pain (see Fig. 12, p. 8).

*Palpation.*—When a joint has been injured recently, or is acutely inflamed, physical examination must be conducted with great circumspection. In other

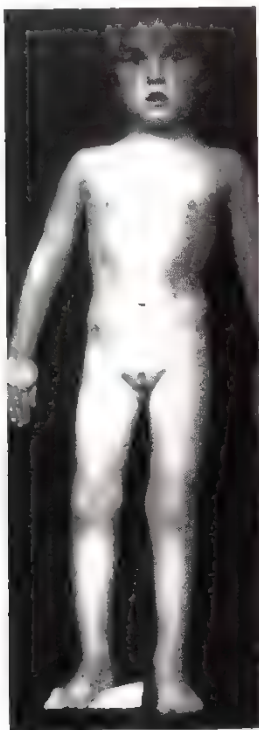


Fig. 757.—Position adopted in early tuberculosis of the right hip-joint; the position of greatest ease.

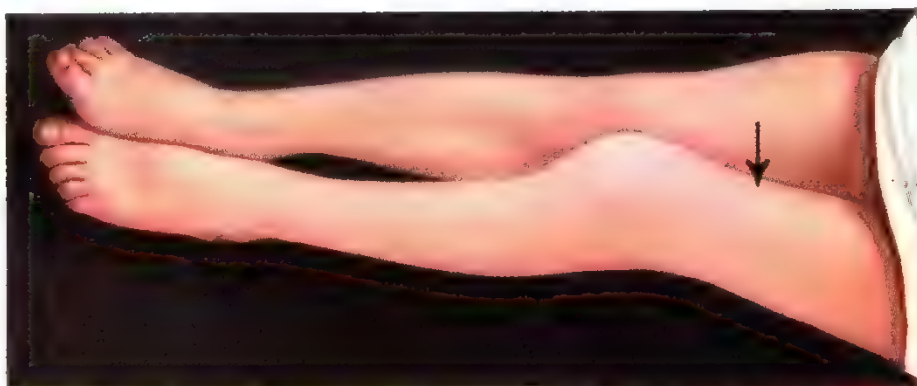
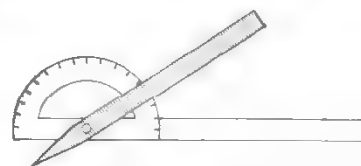


Fig. 758.—Wasting of the quadriceps in a case of tuberculosis of the knee-joint. This case also demonstrates why bygone clinicians called this condition 'tumor albus' (white swelling).

circumstances, thorough inspection having been concluded, the surface of the joint is palpated and any special points of tenderness noted. In the case of the larger joints (e.g., the knee) attempt to assess whether the capsule is thickened by palpating it between finger and thumb. Synovial thickening gives a boggy sensation as if the capsule consists of sponge rubber. This suggests chronic arthritis.

*Movement.*—The recommendations of the American Academy of Orthopaedic Surgeons contained in the study on 'Measuring and Recording Joint Motion' have been adopted throughout this book. Measurements of joint movement should be recorded in degrees of flexion, extension, abduction, and adduction from the Neutral or Zero Starting Position for the Joint. Some joints (hip, shoulder) allow of three-dimensional movement made up of all the above. A goniometer\* should be utilized for accurate measurement of angles. Needless to say, movements of a joint should be compared with those of its opposite fellow.



Ask the patient to move the joint himself; exhort him to display the full range of movement, first in this, and then in that direction. This is the extent of *active* movement. Then, commencing cautiously, put the joint through as much movement as feasible without causing pain. This is the range of *passive* movement. Limitation of all movements of a joint indicates *arthritis* of that joint. Restriction of certain movements only suggests an *extra-articular lesion* or mechanical block, e.g., by a loose body in the joint. If passive movements exceed active movements paralysis of muscles is likely.

*Laxity of Ligaments.*—If, on testing movements of a major joint, the ligaments are noticed to be unduly slack do not hastily conclude that this is the end result of one of the localized diseases of

\* Goniometer. Greek, γωνία = angle + μέτρον = a measure.

joints to be described below. Examine the other large joints for similar slackness. Genu recurvatum (*see* p. 535) or recurrent dislocation of the patella (*see* p. 527) suggest that the patient may be suffering from widespread ligamentous laxity. While syringomyelia and tabes dorsalis usually lead to such slackness in the upper and lower limbs respectively, a number of rare syndromes (notably fragilitas ossium, *see* p. 438) are associated with generalized laxity. There are also well-recognized familial and idiopathic varieties in which the laxity occurs as an isolated abnormality. These patients are prone to recurrent joint effusions. Prolonged treatment of a leg fracture by traction leads to looseness of ligaments proximal to the point of traction; in this instance the joint movements (usually the knee) are invariably limited due to disuse while in other varieties the joints are hypermobile.

**Joint Crepitus.**—The significance of joint crepitus has been discussed on p. 15.

**Auscultation of the Joint** while passive movement of the joint is in progress, is a means of revealing at a very early stage intra-articular roughness or grating not recognizable by other means. In the earliest stages, fine hair-like crepitations are heard, especially at the end of complete flexion and extension. Sites should be chosen that are as free as possible from hair.

**General Examination of the Patient.**—If, from physical signs, a diagnosis of subacute or chronic arthritis has been made, and there is no history of an accident, then:—

*a.* Examine the other joints. In passing, while examining the hands of the patient, look for the presence of Heberden's nodes (*see* p. 495).

*b.* Examine the gums (for pyorrhoea) and the tonsils (for sepsis). Do not jump to any conclusions concerning the findings.

*c.* Examine a specimen of urine for pus and the presence of threads (*see* p. 385).

*d.* In a male suffering from urethritis, examine the prostate, and in relevant cases conclude the examination by performing prostatic massage (*see* Reiter's syndrome, p. 449).

Methods of examining individual joints are considered in more detail later in this book. At this juncture some points of general diagnostic importance will be considered:—

1. **Osteoarthritis\***.—In the aggregate, the majority of chronic arthritic joints, particularly after middle age, prove to be due to osteoarthritis. Hypertrophy of bone, in the form of spurs and osteophytes, is present and may be palpable. There is pain, limitation to a greater or lesser extent of all movements, and, during an exacerbation, often an effusion into the joint. In a few instances the lesion is mono-articular; in the majority several joints are affected, but, unless the disease is advanced, the main symptoms are confined to one joint, usually a weight-bearing joint (knee, hip, spine). The roughened articular surfaces cause coarse crepitations which can be elicited when a hand is laid over the affected joint which is moved. Sometimes crepitus is loud enough to be heard. As the disease advances movements become more limited, and osteophytes sometimes can be felt. One or more osteophytes are liable to become detached, and, as free bodies within the joint, cause episodes of locking.

2. **Rheumatoid Arthritis** generally occurs in subjects more youthful than those attacked by osteoarthritis. Involvement is nearly always bilateral, the metacarpophalangeal joints being the joints most frequently first affected. Compared with osteoarthritis crepitations are relatively fine. The joints are swollen and tender, with movements limited to a lesser or greater extent. An older name for this condition

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\* This is a better term than the previously used 'osteoarthritis'; the condition is not inflammatory.



is 'arthritis deformans', which signifies that if the disease remains unarrested ankylosis with crippling deformities supervenes. Secondary anaemia is found particularly while the disease is active. The typical nodules around the elbow and knee are found in 10 per cent of cases.

3. *Gout* does not always attack the big toe joint (*Fig. 759*). It is easily mistaken for acute bacterial arthritis. In a case of suspected gout look for tophi (*see p. 81*).



*Fig. 759.*—Gouty arthritis\* with an acute exacerbation.

4. *Rheumatic Fever* occurs in children and young adults. The most characteristic feature is that the pain flits from joint to joint, and the arthritis is always multiple and involves the larger joints. Signs of cardiac involvement are usually manifest.

5. *Acute Pyogenic Arthritis* is sometimes difficult to distinguish from acute osteomyelitis; moreover, acute suppurative arthritis is not an uncommon complication of acute osteomyelitis of the upper end of the femur. This subject is discussed on p. 427.

6. *Tuberculous Arthritis*.—This should be suspected in otherwise unexplained monarticular arthritis particularly in old patients and in the tropics. The somewhat spindle-shaped nature of certain tuberculous joints, with the pulpy thickening of the synovial membrane, the warmth, and the muscular wasting usually present (*see Fig. 758*), serve to distinguish tuberculous disease. The bacillus can be cultured from fluid aspirated from the joint.

7. *Haemophilia*.—A history of a bleeding tendency in a male patient with apparent acute arthritis, not otherwise explained, suggests haemophilia.

8. *Charcot's Joint*.—A painless flail joint, often associated with effusion, should bring to mind neuropathy (*Fig. 760*). Do not miss it by forgetting to test the tendon-jerks and the reaction of the pupils. If Argyll Robertson pupils (*see p. 5*) are not present, take two test-tubes, fill one with hot water and one with cold,

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\* The victim goes to bed in good health. About 2 a.m. he is awakened by pain as though cold water was being poured over the joint; soon afterwards he discovers that the joint is swollen (Sydenham—himself a sufferer).

and test for the appreciation of temperature in the limbs. Temperature appreciation is lost in *syringomyelia*. *Leprosy* (see p. 423) is also a cause.

Similar joint changes can follow repeated intra-articular injections of hydrocortisone for rheumatoid arthritis.

9. *Reiter's Syndrome* (non-specific urethritis with arthritis and often conjunctivitis).—Multiple arthritis is a usual feature. The joints involved most commonly, in order of decreasing frequency, are the knees, ankles, wrists, shoulders, spine, and hips. They are hot, swollen, tender, and acutely painful; the overlying skin often becomes reddened. This condition is resistant to all antibiotics as yet discovered, which, in the circumstances, often becomes an important sign.



Fig. 760.—A case of Charcot's knee. Spontaneous dislocation has occurred. There is also a large perforating ulcer of the foot which is covered by the dressing.

10. *Gonococcal Arthritis*.—Is identical with the above. Unless the gonococcus can be identified microscopically in joint fluid it is more likely that Reiter's syndrome is the correct diagnosis.

11. *Clutton's Joints*, a manifestation of congenital syphilis, occur usually in childhood. Symptomless, symmetrical synovitis suggests syphilis and baggy fluid distension of both knee-joints, accentuated by wasting of the muscles of the thighs, is pathognomonic. Remember that this affection commences in *one* joint, and at this stage the local signs are often identical with those of tuberculous arthritis. In a high percentage of cases, interstitial keratitis is present.

12. *Sub-acute Arthritis* occasionally complicates bacillary dysentery and brucellosis.

### GAIT

Just as observation of the facies may help the clinician, so the scrutiny of the gait as the patient enters the consulting-room occasionally provides a clue to the

diagnosis. A limp, particularly a painful limp, can be due to so many causes that it is unsafe to draw any conclusions as to its origin without a full examination.

1. The shuffle with everted toes of a person with extreme flat-foot is characteristic.

2. The waddle of a case of untreated bilateral congenital dislocation of the hip cannot fail to attract attention, and the limp in unilateral cases is fairly characteristic, the pelvis on the affected side dipping downwards as weight is placed on that hip.

3. The toddle of a patient with paralysis agitans is hurried as if the centre of gravity is too far forward, and he is trying to keep up with it.

4. A short leg gives the patient a limp that can be recognized easily.

5. As the patient walks, a stiff knee causes the affected leg to be swung outwards or else the shoulder to be shrugged. A stiff hip-joint causes a bold swing of the limb from the lumbar spine.

6. The patient with a dropped foot scrapes his toe along the ground, and may adopt a high-stepping gait to enable the foot to clear the ground. An examination of his shoe will reveal that the toe of the sole is worn thin.

7. The tabetic keeps his feet widely apart, lifts them abnormally high, and bangs his heel violently on to the ground.

8. The scissors gait of spastic diplegia (Little's disease) is a typical sign. Progression is accomplished by a series of circular steps.

## CHAPTER XXX

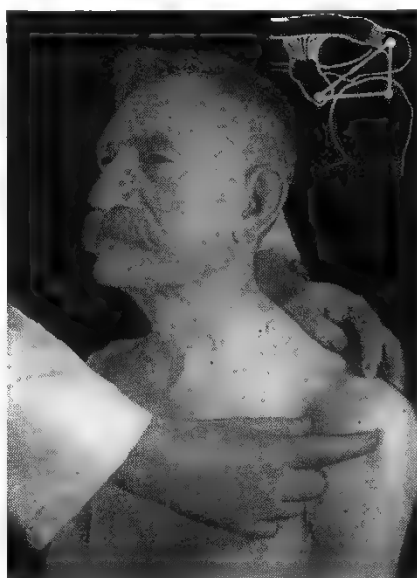
## THE SHOULDER-JOINT AND SHOULDER-GIRDLE

## THE SHOULDER-JOINT

FOR an examination of the shoulder-joint the patient should strip to the waist.

**Bony Landmarks.**—Three bony points are useful in clinical diagnosis in the neighbourhood of the shoulder-joint, a comparison being made with the opposite side (*Fig. 761*).

*Fig. 761.*—The shoulder triangle.  
Tip of coracoid; tip of acromion;  
prominence of greater tuberosity



**Testing Movements.**—The movements of the shoulder-joint cannot be examined properly from in front; from this aspect it is possible to overlook, and even pass as normal, a completely ankylosed joint. The clinician must stand *behind* the patient, where he can observe any movement of the scapula, and, if necessary, fix that bone. It is convenient to grasp the elbow while the various movements are tested, and one should commence by examining the shoulder that is not complained of, to get an idea of the range of movement to be expected in that particular patient.

Start with the shoulder in the Neutral Position, i.e., with the arms at the sides of the body. Glenohumeral together with scapulothoracic movement is global—the arm can normally be placed in any position in any horizontal or vertical plane by a combination of these. In practice it is best to test the following:—

**Abduction** (*Fig. 762*).—When scapular and shoulder-joint movements are combined, the normal range is 0–180°. In a normal joint, the scapula commences to move after the first 20° to 30°; above 90° movement is by scapular rotation; in order to test pure shoulder-joint movement, the scapula must be fixed while the arm is at rest by the side. With the scapula so fixed (*Fig. 762*) the patient is told to raise the arm from the side.

## MOVEMENTS OF THE SHOULDER-JOINT



Fig. 762.—Abduction.



Fig. 763.—Adduction.



Fig. 764.—External rotation.

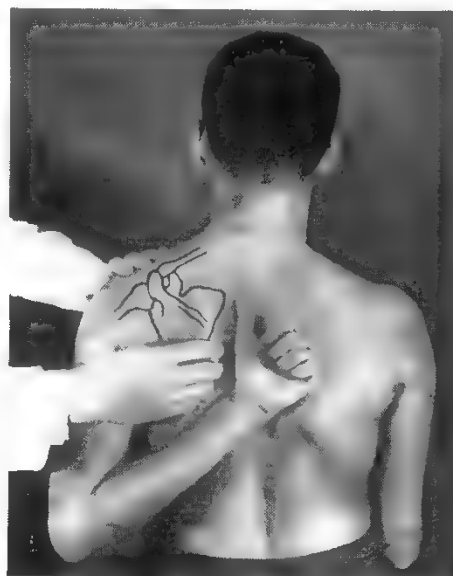


Fig. 765.—Internal rotation.

**Adduction.**—The normal limit of adduction of the shoulder-joint is shown in Fig. 763. With the forearm flexed the elbow comes to the midline. The same precaution of watching, and if necessary fixing, the scapula must be observed, as in all tests of movements of the shoulder.

**External rotation** is carried out as shown in Fig. 764. The flexed forearm should reach a plane almost parallel to the trunk.

**Internal Rotation.**—Ask the patient to place his hand as high as possible on his back (Fig. 765).

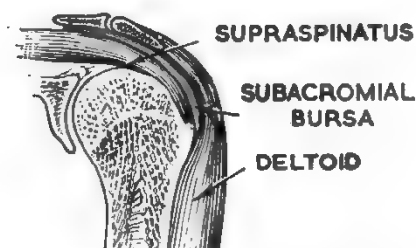
**Palpation of the Shoulder-joint.**—Codman's method. For routine palpation of the shoulder-joint and its environs there is no better method than to place the examiner's hands and the patient's limb in the position shown in Fig. 766, the hands being reversed when the left shoulder is examined. It should be noted that



the pulp of the index finger of the superior hand lies over the supraspinatus tendon near its insertion. When the hands have been positioned correctly, the patient's forearm is carried forwards and back again rather slowly and, if necessary, several times. Joint crepitus (*see* p. 15) or crepitus within the subacromial bursa (*Fig.*



*Fig. 766.*—Codman's method. The thumb lies along the depression below the spine of the scapula; the tip of the forefinger is placed just anterior to the acromion. The other three fingers lie across, and hold, the clavicle. The examiner's lower hand then moves the arm gently back and forth.



*Fig. 767.*—The subacromial bursa. The tendon of the supraspinatus intervenes between the bursa and the shoulder-joint.

767) will be detected by this method, and the forefinger of the uppermost hand is in the optimum position to detect that somewhat elusive, rather common, and extremely important injury—rupture of the supraspinatus tendon.

*Axillary Examination.*—The routine examination of the shoulder-joint should be completed by passing the fingers, *with the pulps directed laterally*, well up into the axilla. In spare individuals the head of the humerus can be felt, and in all, deep palpation high on the lateral aspect of the axilla brings the fingers against the subglenoid synovial pouch of the shoulder-joint.

### ABNORMALITIES OF SHOULDER-JOINT MOVEMENT

Valuable information can be gained by watching a patient *abduct* his arm slowly.

1. If the patient can carry out the movement on the affected side to  $90^\circ$  and then raise the limb perpendicularly above his head (*Fig. 768*), it is proof positive that there cannot be a serious injury to the shoulder-joint or to the shoulder-girdle.

A quick method of proving that both shoulder-joints are normal is to ask the patient to raise both hands above the head with the palms touching and the elbows straight. —→

2. If the mid-part of the range (between  $60^\circ$  and  $120^\circ$ ) is accompanied by pain, the remainder of the movement being painless, supraspinatus tendinitis, subacromial bursitis or a minor fracture of the greater tuberosity of the humerus is the cause (*painful arc syndrome*).

3. If abduction is possible only to about  $40^\circ$ – $50^\circ$  a partial or complete tear of the supraspinatus tendon (*see below*) is likely.

4. If the arm can be raised only very slightly, and, above all, if the patient



supports the injured limb with his other hand, then a fracture or dislocation is practically certain. In the absence of bony injury complete rupture of the supraspinatus, with tearing of the tendinous cuff, is likely, in which case all *passive* movements are full.

5. If pain begins as soon as abduction is commenced and continues throughout the movement, shoulder-joint arthritis of one or other form is probable.

Regarding the other movements, over-enthusiastic immobilization by slinging the arm maintains the limb in a position of internal rotation, therefore it is external rotation that suffers most if adhesions ensue.

**Effusion into the Joint.**—Owing to the thick muscular covering of the capsule an effusion is not manifest until it is quite large (*Fig. 769*). The swelling is fluctuant and extends over the whole shoulder and can be palpated by a finger at the apex of the axilla, cf. enlarged subacromial bursa, p. 457.

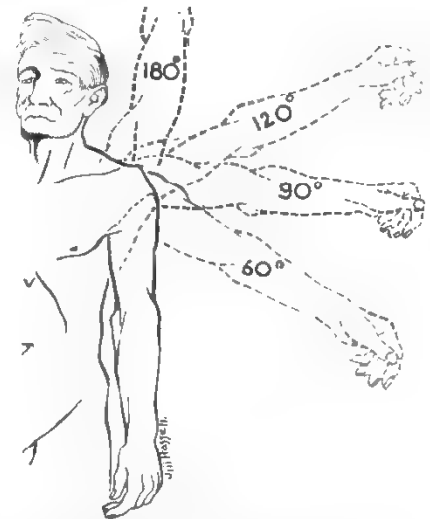
**Chronic Arthritis.**—All the usual forms of arthritis can attack the shoulder-joint. Osteoarthrosis is relatively uncommon as is tuberculosis. When the latter occurs the patient is often an adult, perhaps middle-aged. The arthritis is of the *caries sicca*\* type. There is increasing pain in, and limitation of movement of, the joint. A most significant sign is early wasting of the muscles that activate shoulder movements proper; the deltoid muscle becomes strikingly attenuated. The condition is differentiated from 'frozen shoulder' (*see* p. 457), which gives somewhat similar signs, by characteristic radiological findings, whereas in the latter X-rays are normal (until disuse decalcification results).



*Fig. 769.*—Acute pyogenic arthritis of the left shoulder-joint.

Together, these constitute the *tendinous cuff*. As the tendon of the supraspinatus forms the roof of the capsule of the shoulder-joint and the floor of the subacromial bursa, of necessity, when the tendon ruptures, an open communication results between shoulder-joint and bursa.

With advancing age, the tendinous cuff, and especially the tendon of the



*Fig. 768.*—Observing the patient's performance of abduction gives a great deal of information.

## LESIONS OF SOFT TISSUE OF THIS REGION

**Rupture of the Supraspinatus Tendon** is a common and important cause of disability of the shoulder-joint (*Fig. 770*). The rupture, when extensive, can involve one or more of the structures with which the tendon of the supraspinatus blends before its insertion into the greater tuberosity of the humerus, namely the tendons of the infraspinatus, the subscapularis, the teres minor, and the capsule of the shoulder-joint.

\* *Caries sicca*. A form of tuberculous osteitis characterized by an absence of suppuration.

supraspinatus, undergoes degeneration, rendering it more liable to rupture. Thus this injury can be sustained by lifting a moderate weight.

COMPLETE RUPTURE implies that the whole of the supraspinatus is torn across and that in all probability some other component of the tendinous cuff is implicated



Fig. 770.—Site of maximum tenderness in rupture of the supraspinatus tendon with tear of the tendinous cuff.

as well. Usually the patient is between 55 and 65 years of age. In thin subjects a slight hollowing at the apex of the supraspinous fossa is sometimes visible.

*Active Abduction* of more than about  $50^\circ$  is impossible. The more the patient struggles (often with puffs and blows) to elevate the limb, the more he shrugs the shoulder. During these efforts often the deltoid can be seen contracting vigorously but the arm cannot be abducted by its action alone (Fig. 771).



Fig. 771.—Complete rupture of the supraspinatus. The more the patient endeavours to lift his arm, the more he shrugs his shoulder. Inset.—Showing the fundamental co-operation of the supraspinatus when the deltoid is at work; the supraspinatus must anchor the head of the humerus in the glenoid fossa to enable the deltoid to obtain leverage. If the examiner lifts the arm just above the position shown and then lets go, the arm falls limply to the side.

*Passive Abduction* is painful but after a lapse of a week or two becomes free and painless. Once the arm has been carried above the head it can be held by the contraction of the deltoid muscle. Before Codman's interpretation the patient was thought to be a malingerer.

*Atrophy of the Muscular Portions of the Supra- and Infraspinati* is a characteristic and cardinal physical sign in these cases (Fig. 772). It is present after three or more weeks, especially in the more extensive cases (Moseley).



Fig. 772.—Atrophy of the supraspinatus and infraspinatus following rupture of the tendinous cuff. (After Moseley.)



Fig. 773.—Seeking a sulcus in rupture of the supraspinatus tendon. (After Codman.)

*Palpation.*—The clinician's hands being positioned as shown in Fig. 766, as the patient's arm is moved forwards a 'jog', a wince, fine crepitus (see p. 15), and a sulcus (Fig. 773) make the diagnosis of complete rupture of the tendon of the supraspinatus indisputable (Codman).

**PARTIAL RUPTURE.**—The supraspinatus tendon is partially torn; the remainder of the tendinous cuff is intact. Often the patient is about 45 years of age. The pain is located at the insertion of the deltoid muscle and often radiates down the lateral aspect of the arm (Fig. 774), and sometimes along the dorsal aspect of the forearm as far as the wrist.

*Active Abduction* is limited as in complete rupture in the acute phase but is regained (unless chronic tendinitis supervenes—see p. 457) in a fortnight or so. To find out early whether the tear is complete or incomplete (essential if operative treatment is contemplated for the former) a local anaesthetic injection abolishes the pain and enables full active abduction if the tear is incomplete (Apley).

*Passive Abduction* also has to be halted because of the pain it produces in the early stages.

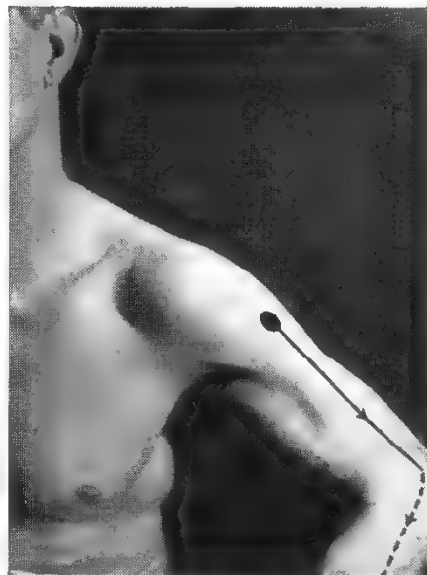
*Palpation.*—When elicited as shown in Fig. 766, there is unmistakable tenderness just below the acromion process.

**Acute Supraspinatus Tendinitis.** Calcium salts are deposited rapidly in an area of degeneration of the tendon so that intratendinous pressure rises until liquefied material the consistency of toothpaste bursts through the tendon into the

subacromial bursa. An adult 25 to 45 years of age experiences a dull ache in the shoulder which rapidly becomes more severe, until in some instances it is agonizing. All movements of the shoulder-joint are limited—abduction especially so. There is exquisite tenderness just beneath the tip of the acromion. After two or three days the pain subsides and usually does not return. The calcified material shows on a radiograph.

**Chronic Supraspinatus Tendinitis\*.**—The condition probably follows partial rupture of the degenerate supraspinatus tendon. Usually the patient is between 45 and 60 years of age. The key physical sign is that in mid-abduction ( $60^{\circ}$  to  $120^{\circ}$ ) there is a *painful arc* of movement, as the thickened supraspinatus tendon becomes nipped between the acromion and the greater tuberosity of the humerus.

Fig. 774.—Location and direction of the pain in partial rupture of the supraspinatus tendon.



**Frozen Shoulder.**—An inflammatory exudate causes the two layers of the synovia of the shoulder-joint to adhere to one another. Usually the patient is 40–60 years of age and more frequently female but patients with cardiovascular disease, unaccountably, present earlier. The initial symptoms are identical with those of partial rupture of the supraspinatus. The pain, however, increases in severity, occurs at night, and prevents the patient sleeping on the affected side. A time is reached when any movement of the joint causes pain, so the patient keeps the joint still, and stiffness of the joint ensues. In a matter of months the ‘freezing’ process becomes so extensive that the head of the humerus becomes glued to the glenoid cavity, and all movements of the shoulder-joint proper are totally restricted. As the freezing process becomes more complete, the pain abates. By this time the muscles around the shoulder show signs of disuse atrophy, but the trapezius is not affected, and a new pain is liable to be located in the neck because, with the muscles that activate the shoulder-joint proper being *hors de combat*, the accessory muscles that raise the scapula are overworked. Months later the stiffness gradually lessens. This curious disease recovers spontaneously but the recovery may take up to two years.

**Enlarged Subacromial Bursa.**—Fluid in the bursa presents as a fluctuant swelling in front and to the lateral side of the humeral head and, with large collections, posteriorly as well (Fig. 775). The fact that the humeral head can be palpated separately differentiates it from an effusion into the shoulder-joint.

### BONE AND JOINT INJURIES

**Dislocation of the Shoulder.**—The usual dislocation is anterior, the head of the humerus coming to lie in the subcoracoid position.

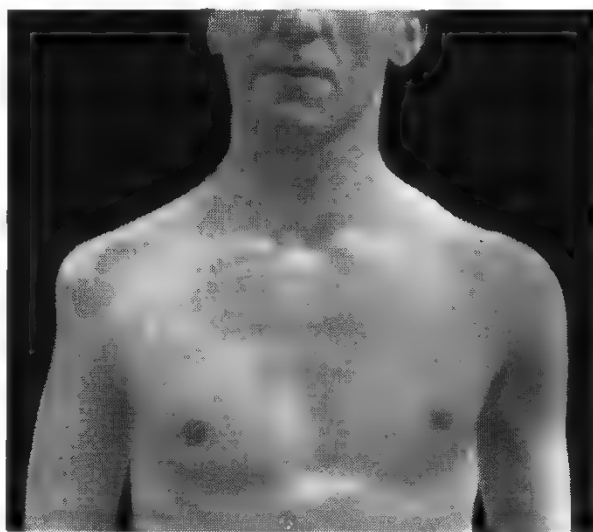
\* This condition is really synonymous with *subacromial bursitis* as the tendon lies in the floor of the bursa.



*Inspection.*—The rounded lateral aspect of the shoulder is lost in favour of a flattened appearance. While flattening of the shoulder is seen typically in dislocation of the joint, it is not an infallible sign. *Fig. 776* shows a case of paralysis of the circumflex nerve with flattening due to wasting of the deltoid muscle. When the shoulder



*Fig. 775.*—Fluid in the subacromial bursa.



*Fig. 776.*—Right circumflex nerve paralysis. Note the wasting of the deltoid muscle.

is dislocated, the patient supports the limb with the hand of the opposite side. The arm on the injured side appears longer than its fellow, and the anterior axillary fold lies at a lower level.

*Palpation.*—The cardinal sign of dislocation is the absence of the head of the humerus beneath the tip of the acromion; the finger-tips pressed against the upper third of the deltoid muscle, instead of meeting bony resistance, sink in. Conversely, when the finger-tips are pressed against the lateral third of the pectoralis muscle, instead of sinking in as they do normally, they meet bony resistance, for here lies the displaced head of the humerus.

In rare cases the dislocation occurs in a *posterior* direction, and in a thin patient, when the examination is conducted from the posterior aspect, an abnormal prominence below the spine of the scapula near its junction with the acromial process can be seen; this is the head of the humerus. Perhaps because physical examination is inclined to be cursory, full reliance being placed on radiography, cases of posterior dislocation of the shoulder-joint are missed unless movements are carefully tested.

*Luxatio erecta*, also a rarity, can hardly be missed. The arm is held fixed above the head.

*Movements.*—Virtually all active and passive movement is lost with a *recent* dislocation. An *old* missed dislocation usually shows a surprising degree of movement but careful fixation of the scapula as detailed on p. 455, reveals that movements at the shoulder-joint have been lost.

**Concomitant Injuries.**—In every case of dislocation of the shoulder the following additional injuries should be sought:—

*Nerve Injury.*—The most common nerve to be injured is the circumflex nerve (*see p. 414*).

*Rupture of the Tendon of the Supraspinatus* (*see p. 454*).—This lesion should be sought early in convalescence after reduction of the dislocation.

**Associated Fracture.**—The greater tuberosity of the humerus is sometimes avulsed. Usually radiography is required to detect the fracture. The neck of the humerus may be fractured at the initial injury.

**Blood-vessels.**—Occasionally the axillary blood-vessels are compressed. Always feel the radial pulse both before and after reduction.

**Fracture of the Clavicle.**—The usual situation of this—the most common fracture during the active years of life—is near the bone's centre. As a rule, displacement is considerable. The lateral fragment is pulled downwards by the weight of the



Fig. 777.—Examining the clavicle for an obscure recent, or un-united fracture. Inset.—Sites of fractures.



Fig. 778.—Position to be adopted when the acromioclavicular joint is being examined. This position renders the joint optimally accessible.

arm, while the medial fragment is held up by the cleidomastoid portion of the sternocleidomastoid muscle. Thus, by inspection and, when necessary, by running the finger along the subcutaneous border of the bone, there is no doubt that the bone is broken, for usually the sharp irregular edge of the medial fragment can be felt projecting beneath the skin, and restoration of the normal line of the clavicle is possible only by raising the shoulder above its normal position. On the other hand, under the age of 14 years, greenstick fracture is common, and may require for its diagnosis the method of examination illustrated in Fig. 777. An overlooked greenstick fracture with excessive callus formation sometimes proves a less elementary problem (*see* p. 443). A fracture of the lateral or the medial end (*see* Fig. 777, inset) is infrequent, and each is very prone to be overlooked.

**Fracture of the Medial End.**—Impaction is often present causing thickening of this part of the bone, with overlying tenderness. Movements of the arm are limited because of pain.

**Fracture of the Lateral End** is more elusive, for frequently the lateral fragment is anchored by the acromioclavicular ligament, and consequently there is no displacement and little or no pain on movement of the arm. In spite of these anomalies, there is always some swelling and definite tenderness over the site of the injury. Not infrequently subcutaneous petechial haemorrhages indicate that the bone has been broken, but radiological confirmation is required.

#### THE ACROMIOCLAVICULAR AND STERNOCLAVICULAR JOINTS

Both joints are readily accessible to the palpating fingers.

**The Acromioclavicular Joint.**—*Subluxation* is not an uncommon injury on the football field and the ice-hockey rink. The extreme outer end of the clavicle can be seen riding above its accustomed

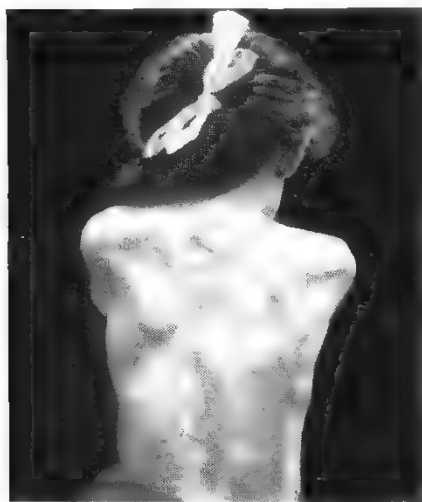
level, and light pressure on the prominence imparts to the examining finger a springboard-like sensation, and causes pain; there is also increased costoclavicular spacing. In less obvious cases the patient should adduct the arm by placing the hand of the affected side on the opposite shoulder, and lean slightly forwards. This renders the joint optimally accessible, and enables the area of tenderness (*Fig. 778*) to be pinpointed. In this way the tenderness of a lesion of the acromioclavicular joint is differentiated easily and certainly from that of a rupture of the tendinous cuff.



*Fig. 779.*—Osteoarthritis of the left acromioclavicular joint with effusion.



*Fig. 780.*—Subluxation of the right sternoclavicular joint.



*Fig. 781.*—Sprengel's shoulder. Note the comparatively small, elevated left scapula.



*Fig. 782.*—Testing for a fractured neck of the scapula.

*Arthritis* of the acromioclavicular joint, commonly post-traumatic, is frequently misdiagnosed as arthritis of the shoulder-joint or rupture of the tendinous cuff. The reason for this is not far to seek, for the patient, as a rule, localizes the pain, not on top of the shoulder, but in the shoulder-joint. The physical signs of arthritis of this small joint usually are quite definite. Sharp pain is experienced when the patient raises his arm *above a right-angle*; this arc contrasts sharply with that of a tendinous cuff lesion. There is tenderness over the joint, and sometimes an obvious swelling in this situation (*Fig. 779*). When the arm is abducted above  $90^\circ$  it is not unusual for crepitus to be elicited over the joint. With upward pressure of the arm carried out in the manner shown in *Fig. 782*, while downward pressure is exerted on the clavicle, the pain of which the patient complains is reproduced at once, due to the joint surfaces grating on one another.

The **Sternoclavicular Joint** is very stable and considerable violence is required to dislocate it. Indirect violence causes *forward dislocation*, and this variety is encountered most frequently. Partial dislocation results in tearing of the intra-articular disk, when a painful clicking occurs in the joint on flexion or circumduction of the arm. In forward dislocation and subluxation (*Fig.*

780) the deformity is obvious on inspection. Unilateral, congenital forward subluxation is fairly common, and it is sometimes familial. *Backward dislocation* is a rare, but serious, accident due to direct violence. The sternal end of the bone is driven backward into the superior mediastinum, and unless masked by overlying contusion, there is a hollow in this situation. Often the patient is in considerable distress from dyspnoea and cyanosis and urgent reduction is necessary.

#### EXAMINATION OF THE SCAPULA

*Congenital elevation of the scapula* (Sprengel's shoulder) is usually evident on inspection (Fig. 781). *Winged scapula* is discussed on p. 415. Bilateral cases must be distinguished from a condition showing a very short neck, and often bilateral webbing of the neck (*Klippel-Feil syndrome*).

A considerable portion of the scapula is readily accessible to the palpating fingers, and, as X-ray examination is sometimes unsatisfactory, clinical methods are all the more important. The spine and acromion are examined by palpating along this bony ridge while the arm is gently hyperabducted. Fractures of the neck of the scapula are particularly liable to be overlooked. Grasp the patient's arm in such a manner that his forearm rests on the examiner's forearm (Fig. 782). By this means the whole of the upper extremity can be raised and lowered gently. Provided the clavicle is intact, abnormal mobility and crepitus suggest a fracture of the neck of the scapula.

## CHAPTER XXXI

## THE ARM

## THE UPPER ARM

**Fracture of the Shaft of the Humerus** is common. The arm is rendered useless and is held by the other hand. There may be an obvious angular deformity (*see Fig. 752, p. 442*) and spasms of severe pain (due to muscular contractions) are characteristic. As a rule the diagnosis can be made on inspection alone. If necessary, the fingers on one side and the thumb on the other are run lightly down the medial and lateral surfaces of the upper arm. If X-ray facilities are not available and should there still be doubt, the upper limb is grasped as shown in *Fig. 783* and the arm is abducted carefully; if a fracture is present, mobility in the length of the bone will become apparent.

Test the integrity of the radial nerve (*see p. 415*) in all fractures of the shaft of the humerus, as sometimes it is damaged by the broken ends of the bone where it lies in the spiral groove against the bone. Also feel the radial pulse.

**Fracture of the Humerus in a Neonate.**—The shaft of the humerus is the most common site of any fracture occasioned by difficult delivery.

**Fracture of the Neck of the Humerus** occurs largely in elderly women, sometimes in children, after a fall on the outstretched hand. There is severe pain, complete loss of function, and the arm is supported by the other hand. The region of the shoulder-joint is swollen and ecchymoses are present on the medial aspect of the arm and/or the chest wall. The following tests are necessary in the absence of X-ray facilities:

**Sign of Non-rotation of the Head of the Humerus.**—If the head does not move when the shaft is rotated by very gentle limited circumgyration of the flexed forearm, the diagnosis of fracture of the neck of the humerus is confirmed.

**Impacted Fracture.**—The stumbling-block is that, in the adult, the fracture of the neck of the humerus is frequently impacted, in which event the above sign is null and void. The clinician must resort to *comparative measurement*. The distance between the tip of the acromion and the most prominent portion of the lateral epicondyle is ascertained and recorded on the sound side. This measurement is then taken on the injured side (*Fig. 784*) and the two readings compared.

**Fracture of the Greater Tuberosity** is commonly associated with dislocated shoulder (*see p. 457*) but occasionally is found as an isolated injury. Palpation reveals tenderness and swelling localized to the tuberosity, and the ability to abduct the shoulder (*see p. 451*) is absent.



*Fig. 783.*—Testing for fracture of the shaft of the humerus. The forearm is supported, and the arm is abducted carefully.



**Rupture of the Biceps Brachii Muscle.**—In rupture of the belly of the muscle there are two lumps separated by a gap. In rupture of the tendon there is but one lump. The latter is much commoner and although, as a result of heavy lifting, rupture of a normal tendon can occur, more often the rupture takes place less dramatically, or even spontaneously because the tendon has undergone attrition due to degenerative changes associated with advancing age. Therefore always examine the shoulder-joint for signs of osteoarthritis with which rupture of the tendon is sometimes associated.



Fig. 784.—Measuring the length of the arm. The distance between the tip of the acromion and the lateral epicondyle is measured on each side.



Fig. 785.—Rupture of the tendon of the biceps. Inset: the anatomical explanation of the lump.

As a rule, signs of rupture of the tendon of the biceps are unmistakable (Fig. 785): when the patient flexes the elbow the belly of the muscle retracts into the lower third of the arm and (accentuated by the hollowing above) stands out in a veritable 'village blacksmith' fashion. In cases where the biceps is wasted and the lump is less conspicuous, flexion of the elbow against resistance causes the swelling to become more evident. In recent cases pain and tenderness along the bicipital groove, with perhaps some ecchymosis below the deltoid muscle, are likely to be present.

**Bicipital Tenosynovitis** occurs, as a rule, in young adults. It is the result of excessive use of the biceps while at work or at play (e.g., ski-ing); this painful disability comes on a day or so after the undue or unaccustomed strain. The patient avoids lifting heavy objects, and unless compelled to do otherwise, keeps his arm by his side and his elbow flexed. Movements of the shoulder are all somewhat limited, abduction being especially painful. He points to the region of the insertion of the pectoralis major as the site of the pain, and in severe cases the pain shoots down the arm.

**Yergason's Sign.**—The elbow is flexed to a right-angle and the forearm is pronated by the patient. The clinician grasps the patient's wrist and then requests him to supinate the forearm against resistance, thus bringing the biceps into action. When pain is localized to the anteromedial aspect of the shoulder, the sign is positive.

## THE ELBOW-JOINT

**Bony Landmarks.**—Three bony points—the *tip of the olecranon*, the *medial epicondyle*, and the *lateral epicondyle*—form an equilateral triangle when the elbow is flexed (Fig. 786). When the forearm is extended the tip of the olecranon ascends to bring the three bony points into the same horizontal straight line.



Fig. 786.—Determining the three bony points that form the elbow triangle. In full flexion the triangle becomes equilateral.

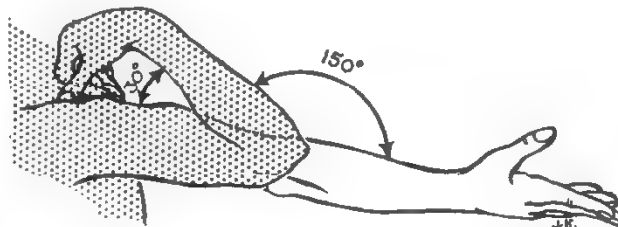


Fig. 787.—The normal range of flexion and extension of the elbow-joint. (After Colonna.) Full extension is regarded as the Neutral Position but up to 15° of hyperextension is seen in some normal individuals.

**Testing Movements.**—The normal range is shown in Fig. 787. Attention is drawn here to the *carrying angle*, which allows the arm to swing slightly away from the body, and so carry objects more easily.

This angle (10° in males and 20° in females) becomes apparent only in full extension of the forearm, and is due to the articular surface of the humerus being set obliquely. The angle may become altered by fracture of, or injury to the epiphysis of, the lower end of the humerus. If the angle is decreased, the condition is known as *cubitus varus*, when increased, as *cubitus valgus*. The importance of the latter deformity is that it causes the ulnar nerve to become stretched or exposed unduly to trauma.

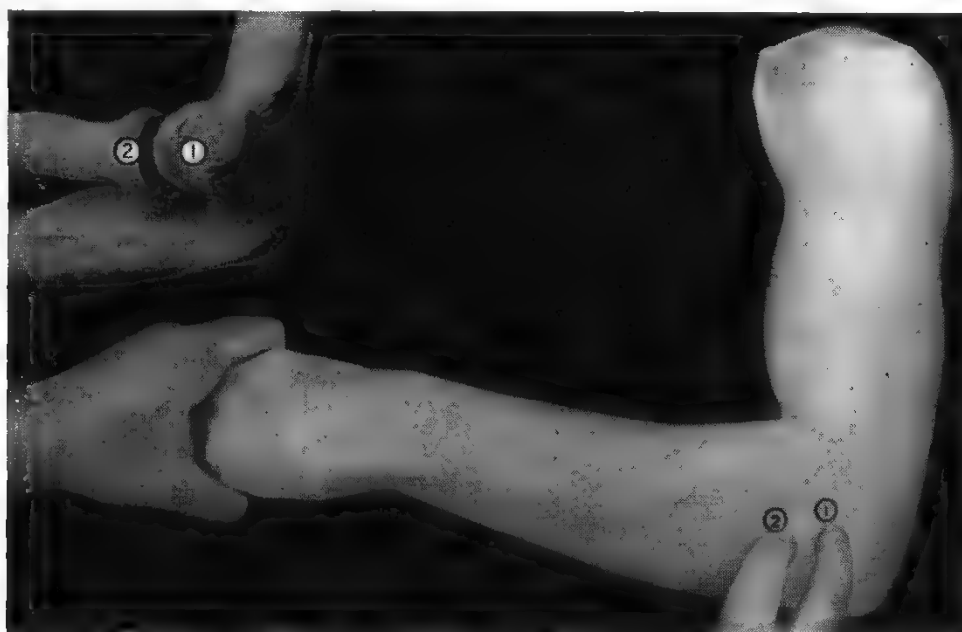


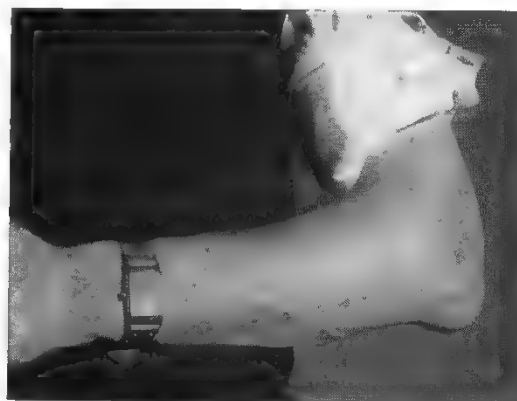
Fig. 788.—Testing for the integrity of the head of the radius.

Pronation and supination.—See p. 470.

*Testing the Integrity of the Head of the Radius.*—This lies more posteriorly than one is apt to think. To find it, rest the tip of the middle finger on the lateral epicondyle (*Fig. 788*), then place the index finger alongside it, the elbow being at a right-angle. The arm is then pronated and supinated, and the head of the radius is felt to rotate beneath the index finger.



*Fig. 789.*—Loose bodies in the elbow-joint with effusion. Left inset, the radiograph. Right inset, the loose bodies removed at operation.



*Fig. 790.*—Effusion into the olecranon bursa. Miner's elbow.

**Effusion of the Elbow-joint** first manifests itself by filling up of the concavity on each side of the olecranon, because here the synovial cavity is nearest the surface and the posterior ligament is thin and lax. As more fluid accumulates some degree of swelling is also noticeable posterolaterally over the radiohumeral joint. Test for transmitted fluid impulse between this area and the swelling over the medial aspect of the olecranon. This sign distinguishes an effusion into the joint from an enlargement of the bursa beneath the triceps tendon (a rarity). Another point of distinction is that in cases of effusion into the elbow the joint is always held in position of semi-flexion—the position of greatest capacity.

**Chronic Arthritis.**—All the usual forms of arthritis can attack the elbow-joint. *Tuberculosis* occurs in adults more often than in children, and because of early muscular atrophy the joint assumes a fusiform appearance. When confronted with what appears to be a monarticular *osteoarthrosis* of the elbow-joint pause for a moment to consider three other possibilities.

*Loose Bodies in the Joint.*—Especially if there is a history of locking, loose body is a diagnosis that should spring to mind (*Fig. 789*). Occasionally the 'joint mouse' can be palpated.

*Osteochondritis Dissecans* (see p. 527) of the elbow is uncommon compared with that of the knee but the elbow is the second site numerically for the condition. The capitulum is usually involved. Before the stage of loose body in the joint, the only sign is a recurrent effusion.

*Charcot's Joint* (see p. 448).

#### LESIONS OF THE SOFT TISSUES ABOUT THE ELBOW

**Miner's (syn. Student's) Elbow.**—The effusion into the bursa over the subcutaneous surface of the olecranon process can hardly be mistaken (*Fig. 790*). This bursa is prone to pyogenic inflammation (olecranon bursitis).

**Examination of the Supratrochlear Lymph-node.**—Quite significant enlargements of this node are missed because a search is made with the arm in the extended position. First flex the arm to a right-angle, in order to relax surrounding structures. *Fig. 791* shows the node being palpated; when enlarged, it will be found



*Fig. 791.*—Palpating the supratrochlear lymph-node. Note that the elbow is flexed.



*Fig. 792.*—Cozen's test. Flexion of the wrist against the patient's attempt to keep the wrist extended causes pain in the region of the lateral epicondyle.

slipping beneath the finger and thumb on the anterior surface of the medial intermuscular septum a centimetre above the base of the medial epicondyle. Enlargement of this lymph-node is very frequent in cases of infected lesions of the hand, wrist, and forearm. Bilateral enlargement suggests a generalized disease of lymph-nodes and biopsy is necessary for diagnosis; this often applies to unilateral enlargements. A positive serological test for syphilis sometimes provides a surprise.

**Bicipitoradial Bursitis.**—There is a bursa beneath the tendon of the biceps, near its insertion. Occasionally this bursa becomes inflamed, especially after repeated throwing of a ball. In this instance the inflamed bursa is rarely palpable, but there is pain and tenderness over the insertion of the tendon in front of the elbow-joint, and the pain is accentuated by the movements of flexion and supination.

**Tennis Elbow (Epicondylitis)** takes its name from the sprain sometimes sustained by tennis players. Nevertheless, comparatively few of the numerous sufferers play tennis. There is a throbbing ache on the lateral aspect of the elbow, or in the region of the origin of the common extensor muscles (a few fibres of which have probably been torn), accentuated by lifting small objects, if that manœuvre entails dorsiflexion of the wrist. To the surprise of all concerned, the patient can carry a bucket of water without any special discomfort. There is no limitation of movement of the elbow-joint and no pain on such movement.

**Palpation.**—Usually a point of considerable tenderness will be found over the lateral epicondyle (*see Fig. 12*, p. 8), sometimes this point lies more distally, viz., over the radio-humeral joint or even over the head of the radius.

**Cozen's Test.**—Ask the patient to clench his first and keep it clenched, and then to extend the wrist. Grasp the lower forearm in the left hand, and while the patient continues to try to keep the wrist extended flex the wrist firmly and steadily (*Fig. 792*). This places considerable tension on the origin of the extensor tendons at the lateral epicondyle, and causes the pain of which the patient complains.

**Mills's Manœuvre.**—With the elbow quite straight and the wrist flexed, pronate the forearm (*Fig. 793*). This brings on the characteristic pain, and does so only in cases of tennis elbow.

**Golfer's or Baseballer's Elbow** is relatively uncommon. The tenderness is situated in the common flexor origin from the medial epicondyle.

**The Elbow Tunnel Syndrome** is infrequent compared with the carpal tunnel syndrome (*see p. 473*). The pain, which passes down the forearm, is confined to



*Fig. 793.*—Pronation of the forearm with the arm straight causes pain at the origin of the common extensor muscle (inset). Mills's manœuvre.



*Fig. 794.*—Traumatic elbow effusion showing the typical posture.

the distribution of the ulnar nerve below the elbow. Muscular wasting affects principally the hypothenar eminence. Compare the carrying angle of the elbow-joint with that of the opposite side; if cubitus valgus (*see p. 464*) is present, the cause of the symptoms is explained. Palpate the ulnar nerve in its groove; if pressure on the nerve reproduces pain and tingling it suggests that the neuropathy originates here, provided always the signs are limited strictly to those of a lesion of the ulnar nerve at the elbow (*see p. 419*). Signs of osteoarthritis of the elbow-joint are found occasionally. A tight band\* compressing the ulnar nerve in, or just below, its groove is found to be the cause when the elbow-joint is normal.

#### FRACTURES AND DISLOCATIONS AROUND THE ELBOW-JOINT

The injuries to be described are all accompanied by a greater or lesser degree of traumatic effusion into the joint (*Fig. 794*). The arm is held immobile by the side or supported by the other hand. The diagnosis can be suggested clinically before resorting to X-ray examination which is, however, essential for accurate diagnosis, particularly if multiple fractures are present, as they frequently are with the severe trauma of present-day motor-car accidents.

In particular dislocated elbow may be associated with any or several of the fractures in this region to be described, and especially the anterior dislocation occasioned by a car driver's elbow protruding from the open window being struck by a passing car ('side swipe' fracture-dislocation).

\* The fibrous arch of origin joining the two heads of *flexor carpi ulnaris*.



**Supracondylar Fracture of the Humerus** is a common injury of childhood; indeed, when it occurs later in life the patient is nearly always under 20 years of age. This fracture, which follows a fall on the outstretched hand, is of exceptional importance because of three threatening complications—two early, and one late—Volkman's ischaemic contracture (*see* p. 491), injury of the median or, rarely, the radial or ulnar nerves (*see* Chapter XXVII), and myositis ossificans. Because of the overriding importance of diagnosing the first of these at the very outset, always examine the radial pulse\* in every case of a bony injury about the elbow. In most instances posterior displacement of the lower fragment occurs, and the elbow, with the forearm, is carried backwards. Therefore, like backward dislocation of the elbow-joint, the elbow is unduly prominent, but there is a striking difference: the three bony points are found to be in normal equilateral triangular relationship. With the comparatively uncommon forward displacement of the lower fragment the signs are less striking. When the fracture is complete comparative mensuration (*see* Fig. 784) is often valuable. This is the fracture above all in which a most careful watch must be kept on the radial pulse *after reduction*.

**T-shaped Fracture of the Lower End of the Humerus**, in contradistinction to the above, nearly always occurs in an adult, and the fracture is sustained in a different way—the patient falls, striking the elbow. The shaft of the humerus may be driven between the two condyles, giving obvious deformity in the shape of broadening of the elbow. In other circumstances the signs are similar to those of a transverse supracondylar fracture. The bony points cannot be identified on account of swelling, but a haemarthrosis, as evidenced by obvious effusion into the joint (*see* p. 465), leaves little doubt that a serious fracture is present.



Fig. 795.—Characteristic attitude and deformity in backward dislocation of the elbow-joint.

**Dislocation of the Elbow-joint** occurs both in children and in adults as a result of a fall on the outstretched hand. A backward dislocation (*Fig. 795*) illustrates the three characteristic signs of a dislocated joint extremely well: (1) *Abnormal contour*—the olecranon protrudes abnormally; (2) *Abnormal attitude*—the arm is held up at  $130^{\circ}$ ; (3) *Immobility*—neither active nor passive movement of the joint is obtainable.

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\* Only rarely is the radial pulse congenitally absent.

Unlike a supracondylar fracture, when the elbow is dislocated the tip of the olecranon is displaced and the bony triangle (*see* p. 464) is no longer equilateral.

**Fracture of the Olecranon Process** can occur as the result of direct or indirect violence. There is considerable local swelling, and maximum tenderness is situated in the region of the olecranon. If separation is complete, there is inability to extend the flexed forearm. Wide separation of the fragments, which can be detected by palpation, and is due to contraction of the triceps, occurs when the fracture is complete.

**Fracture of the Coronoid Process** is much less frequent than the above. This fracture can occur as a complication of backward dislocation of the elbow-joint, in which event the dislocation recurs immediately after it has been reduced. Rarely, the fracture occurs in the absence of dislocation, in which case it is unlikely to be diagnosed without the help of radiographs. Tenderness in the front of the elbow-joint alone is suggestive.

**Fracture of the Head (adults) or Neck (children) of the Radius**, resulting from a fall on the outstretched hand, is a common accident. The three bony points of the elbow are in correct alinement. Flexion and extension are performed somewhat hesitatingly, but to a large degree painlessly. Indeed, up to this stage the possibility of the patient having sustained a fracture often seems remote, but when rotation is attempted tell-tale restriction of movement is most noticeable. Now comes the crux of the examination—there is tenderness, often exquisite, over the head of the radius (*see* Fig. 788, p. 464).

**Subluxation of the Head of the Radius** ('pulled elbow').—A child's arm is pulled forcibly, either to remove it from danger, or when it indulges in a temper tantrum. As a result the radial head subluxates through the annular ligament. The signs are as above, but a child is much less inclined to allow an efficient examination than an adult.

**Fracture of the Lateral Epicondylar Epiphysis**.—Usually the patient is a child (5–15 years) who, following a fall, has a swollen elbow-joint which he will not move. The finger can be run along the back of the upper arm without eliciting tenderness; consequently a supracondylar fracture is most unlikely, but there is tenderness over the lateral side of the joint. The child can sometimes be coaxed to rotate the forearm as the neck of the radius is intact.

**Separation of the Medial Epicondylar Epiphysis**.—Similar signs with tenderness on the medial side in an adolescent are suggestive.

**Fracture of the Capitulum**.—If the effusion is not large it may be appreciated that there is fullness (the displaced fragment) in front of the elbow. Flexion is the movement which is largely lost. This fracture usually occurs in adults.

## THE FOREARM

The ulna can be palpated along its subcutaneous border throughout its length. The lower two-thirds of the radius is accessible also.

**Testing Movements**.—The Neutral Position is with the elbow flexed to a right-angle and the thumb upward. Pronation and supination of 90° each is normally possible (*Fig. 796*). If the elbow is extended a further 90° of movement is possible owing to circumduction at the shoulder. Limitation of pronation-supination may indicate a lesion of elbow, forearm, or wrist.

**Madelung's Deformity**.—This is a dorsal subluxation of the lower end of the ulna. Usually the patient is an adolescent female who complains of weakness of the wrist, where a very prominent displacement of the lower end of the ulna can be seen (*Fig. 797*). Palpation reveals a grossly unstable inferior radio-ulnar joint. Whether the condition is congenital or acquired is disputed. Many believe that repeated minor injuries delay growth of the radius while the ulna continues to grow, and that this unequal rate of growth forces the lower end of the ulna to subluxate.

**Fracture of the Shafts of Both Bones of the Forearm** is frequently encountered. In the case of a greenstick fracture both bones are bent but ultra-free mobility in the length of the bones is lacking. When the fractures are complete, there is an angular deformity causing the shape of the forearm to become altered so unmistakably that little more than inspection is required to make the diagnosis. Moreover, the patient supports the forearm and hugs it to the body.

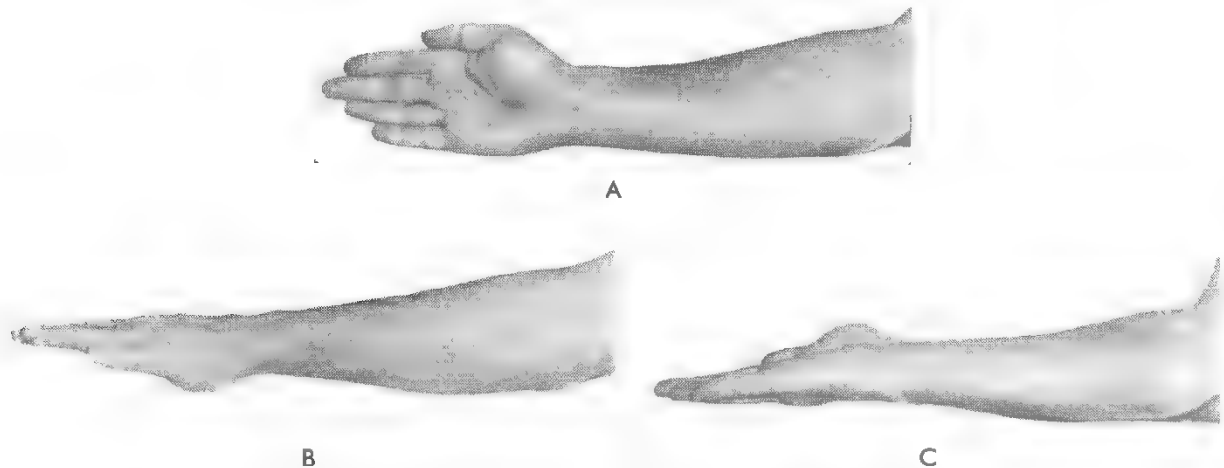


Fig. 796.—A, The Neutral Position for measuring forearm movement is the thumb-up position with the elbow flexed to a right-angle. B, Full pronation. C, Full supination.

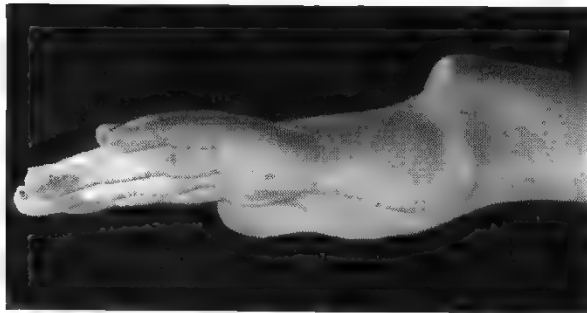


Fig. 797.—Madelung's deformity. Female 18 years of age.

**Warning.**—Fracture of a single forearm bone *with displacement* is impossible without dislocation of the head of the radius in the case of the ulna, or of the inferior radio-ulnar joint in the case of the radius. To miss the dislocation is an extremely serious error.

**Fracture of the Shaft of the Ulna**, which, unlike fractures near the wrist, is due to direct violence, gives rise to comparatively few signs. As the radius splints the broken ulna, there is little displacement of the fragments and the contour of the limb remains normal. For the same reason the patient does not support the injured limb. The diagnosis can be made by drawing the finger along the subcutaneous border of the ulna when the local swelling, tenderness, and possibly other signs of a breach of continuity of the bone will be elicited.

**Fracture of the Shaft of the Ulna with Dislocation of the Head of the Radius** (*Monteggia fracture dislocation*).—In addition to the signs of a fracture of the shaft of the ulna given above, the fractured bone is bowed, or less commonly the fragments overlap.

→ If sought for carefully (and it will be sought only if one is armed with the knowledge of the frequent association of these two lesions) forward displacement of the head of the radius will become evident.



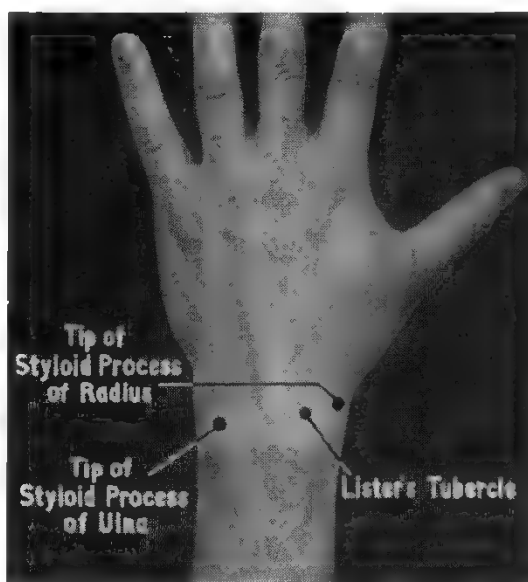
**Fracture of the Shaft of the Radius** is less common than fracture of the shaft of the ulna. The displacement is variable, but is especially evident when the fracture is associated with dislocation of the lower radio-ulnar joint (*Galeazzi fracture-dislocation*). →



### THE WRIST-JOINT

**Bony Landmarks (Fig. 798).**—*The Styloid Process of the Ulna*, which lies on the dorsal aspect of the wrist, can be defined at once, for it is completely subcutaneous. *The Styloid Process of the Radius* is truly lateral, projects about 1 cm. more distal than the corresponding process of the ulna, but is less obvious than the latter because the tendons forming the radial boundary of the anatomical snuff-box intervene between it and the palpating finger. In spite of this, the styloid process

Fig. 798.—The bony landmarks on the back of the wrist.



of the radius can be felt beneath and on either side of the tendons in question, and by deep palpation even its tip, which marks the line of the wrist-joint, can be discerned. Continuing deep palpation from the base of the styloid process across the anatomical snuff-box towards the ulna, another bony projection will be encountered in a line with the cleft between the index and middle finger, the dorsal tubercle of the radius (*Lister's tubercle*), which marks the lateral boundary of the groove for the tendon of the extensor pollicis longus.

**The Structures in Front of the Wrist, with Special Reference to Flexor Tendons and Nerves.**—The anterior surface of the wrist is one of the principal finger-posts of the medical and nursing professions. Students of surgery, while sharing the appreciation of the radial pulse, must be familiar with the other structures that can be seen or felt on the volar aspect of the wrist. Usually the most conspicuous of these is the tendon of the palmaris longus. In 10 per cent this is absent on one or both sides. To familiarize yourself with the structures that lie beneath the volar surface of the wrist, proceed as follows: commencing on the ulnar side, locate the pisiform bone. By placing the fingers in the position shown in *Fig. 799 A*, the tendon of the flexor carpi ulnaris is rendered tense, and can be traced downwards to its insertion into the pisiform bone. Next, by making a fist, keeping the wrist flexed (*Fig. 799 B*), the tendons of the (1) flexor carpi ulnaris, (2) flexor digitorum sublimis to the *ring*

finger, (3) palmaris longus, and (4) flexor carpi radialis, can be palpated with certainty (Scheldrup).

At the bottom of the groove between the flexor carpi radialis and the palmaris longus lies the median nerve. Especially if the palmaris longus is absent, in some individuals it is possible to palpate this nerve lying immediately to the ulnar side of the tendon of the flexor carpi radialis muscle. On the radial side of the flexor carpi radialis, lying directly on the bone, is the radial artery.



Fig. 799.—1, Flexor carpi ulnaris; 2, Flexor digitorum sublimis (slip to ring finger); 3, Palmaris longus; 4, Flexor carpi radialis.



Fig. 800.—Cut wrist. The flexor carpi ulnaris and the ulnar nerve were found to be severed.

Many opportunities present to apply this knowledge. Take, for example, cut wrist (Fig. 800). In this instance the flexor carpi ulnaris tendon and the ulnar nerve were severed—a frequent combination. The state of affairs is shown 3 weeks later. One of the first signs of ulnar paralysis is abduction of the little finger which drifts away from the others (loss of the adductor function of the fourth palmar interosseous), and takes up a position of semiflexion.

**Testing Movements.**—The Neutral Position is one in which the hand is in line with the forearm. In a young adult the normal range of movement between full extension and full flexion (Fig. 801) is  $150^\circ$ . As age advances, especially in those who do not perform manual work or play, this range becomes slightly less. To test radial and ulnar deviation (sum total about  $50^\circ$ ) the lower forearm must be held in a fixed position during the test (Fig. 802). To test complete mobility of the joint the patient is requested to perform circumduction.

Although it is customary to attribute all these movements to the wrist-joint, none can be dissociated from movements of the carpal joints.

**Chronic Arthritis** produces swelling, tenderness, and limitation of movement. *Osteoarthritis* after injury is fairly common, as is *rheumatoid arthritis*. *Gonococcal*



*arthritis* is rare, but when it occurs it is frequently overlooked for long periods for want of examining the prostate and urethra. In Britain, *tuberculosis* of the wrist, in common with tuberculous arthritis of other joints, has become much less frequent, but this is not the case in many parts of the world. It gives rise to a spindle-shaped swelling of the joint with 'tumor albus' (*see* p. 448), together with palmar flexion. In countries where tuberculosis has become rare it is a disease of the elderly. Abscess and sinus formation occur early because the dorsal surface of the joint is superficial.



Fig. 801.—Normal range of extension (70°) and flexion (80°).



Fig. 802—Normal range of radial (20°) and ulnar (30°) deviation. The latter is slightly greater because of the relative shortness of the styloid process of the ulna.

#### LESIONS OF SOFT TISSUES ABOUT THE WRIST

**The Carpal Tunnel Syndrome\*** denotes a compression neuropathy of the median nerve as it passes beneath the flexor retinaculum (*Fig. 803*). The majority of patients are women, many of them in the fifth or sixth decade. In more than 50 per cent of cases the symptoms are bilateral, but more in evidence in the dominant hand. The patient complains of progressive weakness or clumsiness, due to impairment of the finer movements of the hand (e.g., picking up a pin, sewing, knitting), associated with acroparaesthesia, i.e., attacks of pain, tingling, and numbness of the affected hand, the ring and little fingers escaping. Often the hand is described as feeling swollen. Characteristically the attacks are nocturnal. Occasionally aching or pain radiates upwards, even as far as the shoulder, but never are there objective sensory changes proximal to the wrist. The syndrome is occasionally secondary to narrowing of the tunnel after a Colles's fracture (*see* p. 476), or in rheumatoid arthritis (*see* p. 495), is seen temporarily in pregnancy, and rarely from other causes, but the great majority are idiopathic.

*Wasting of the Thenar Eminence* is present only in a few late cases.

*Hyperaesthesia* is present over the distribution of the median nerve (*see Fig. 727*, p. 420). It can be demonstrated in 96 per cent of cases (Phalen).

**The Wrist Flexion Test (Phalen's Sign).**—The patient is asked to flex both wrists, and keep them flexed for 60 seconds. In more than half the patients there is a

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\* Ormrod first described the idiopathic variety in 1883.

prompt exacerbation of paraesthesia in one or both hands, and equally prompt lessening of these symptoms when the flexion is discontinued.

The *tourniquet test* has a similar effect; the cuff is pumped up to the systolic blood-pressure for the same time.

If the diagnosis is in doubt studies of the electrical impulses in the median nerve show a delay in motor conduction at the wrist on the affected side.

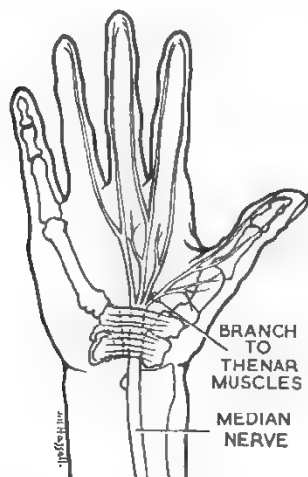


Fig. 803.—The carpal tunnel lies between the flexor retinaculum in front and the carpal bones behind. Should the tunnel become narrowed, limitations of space subject the median nerve to compression.

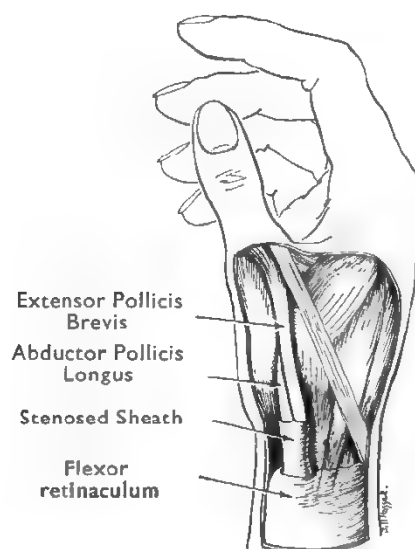


Fig. 804.—Usual site for stenosing tenosynovitis.

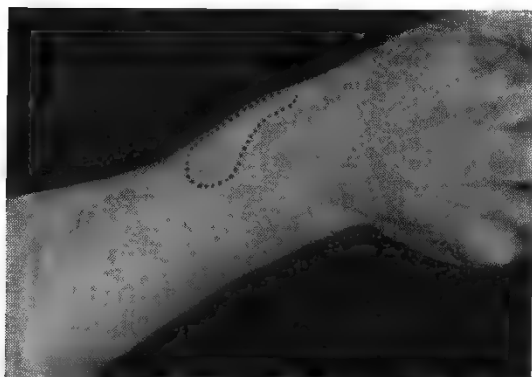


Fig. 805.—Tenosynovitis of the lower forearm, showing the typical swelling.



Fig. 806.—Finkelstein's test. With the thumb in the palm and the fist clenched, ulnar deviation induces pain.

**De Quervain's Disease** (Stenosing Tenosynovitis), which occurs only in adults, is a painful, disabling condition affecting the common tendon-sheath of the abductor pollicis longus and the extensor pollicis brevis which becomes chronically inflamed, and subsequently stenosed at the radial styloid process (Fig. 804). The patient, usually an adult female, experiences pain at the site of the affected tendon-sheath, and points to this region as the site of pain. In long-standing cases often there is a swelling, likened in size, shape, and consistency to an orange-pip, just proximal to the styloid process (Fig. 805). Fine crepitus may be present (see p. 15).

Only in man and the gorilla is the extensor pollicis brevis present; it aids in the final movements of the thumb. The addition of this muscle seems to have caused a crowding effect in the tendon-sheath, hence this specialized form of tenosynovitis, which occurs as a result of excessive movement of the thumb in certain occupations.

*Passive Extension of the Thumb* is painless, but active extension brings on the pain complained of.

*Localized Tenderness* at the site shown in *Fig. 804* is always present.

*Finkelstein's Test*.—With the thumb in the palm, the patient is requested to make a fist by superimposing the fingers over the thumb. The hand is then pressed into ulnar deviation (*Fig. 806*). If pain is experienced at the radial styloid process the test is positive. Frequently when the sign is positive the pain shoots down to the thumb and/or towards the elbow-joint.

**Ganglion**.—A simple ganglion is the result of a myxomatous degeneration occurring in a portion of the connective tissue of the capsule of a joint. The cyst so formed becomes filled with crystal-clear gelatinous fluid. The most common situation for a ganglion is on the dorsal aspect of the wrist over the scaphoid-lunate articulation. The swelling thus produced (*see Fig. 66, p. 30*) is rounded and sessile, and becomes tense and prominent when the wrist is flexed, and partially or wholly disappears when the wrist is extended. The second most common site is on the volar surface of the wrist between the tendon of the flexor carpi radialis and the brachioradialis (*Fig. 807*).



*Fig. 807*.—Ganglion situated between the flexor carpi radialis and the brachioradialis—the second most common situation.

A ganglion giving rise to symptoms is usually between 0.5 and 3 cm. in diameter and, more often than not, the swelling is slightly tender to pressure. As a rule it is filled so tightly with gelatinous material that it feels solid. Occasionally fluctuation can be elicited, especially when the swelling lies on the flexor aspect of the wrist.

When the swelling is large enough to be tested (unusual) it will be found to be translucent.

*Ganglion of Finger.*—See p. 490.

*Ganglion of Ankle and Foot.*—See p. 564.

#### BONE LESIONS IN THE VICINITY OF THE WRIST

**Colles's Fracture.**—Although the lower end is the broadest, it is the weakest part of the radius, because except for a thin shell, it is composed of cancellous bone. So it comes about that Colles's fracture—a fracture of the radius within 3 cm. of its distal extremity—is the commonest fracture (1 in every 8 fractures). Women of middle age onwards sustain it more frequently than any other type of individual: with few exceptions, the cause is a fall on the palm of the outstretched hand. In about half the styloid process of the ulna also is broken. Impaction of the main fragments is usual. In all cases, whether firmly impacted or not, local tenderness and loss of function of the wrist-joint are conspicuous features. The 'dinner-fork' deformity

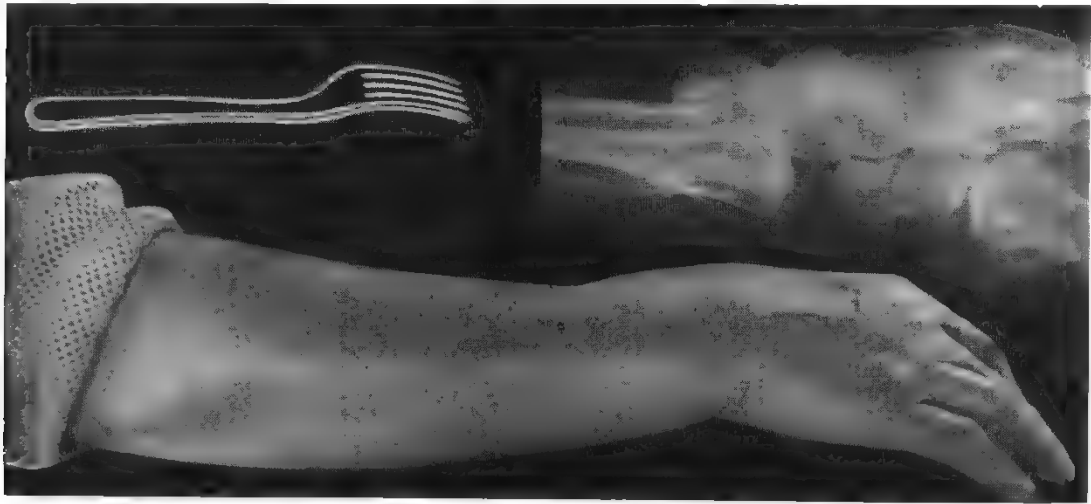


Fig. 808.—Colles's fracture. The dinner-fork deformity.

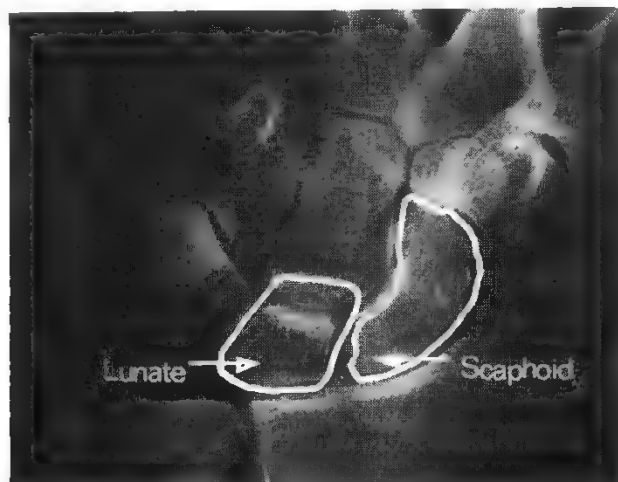
(Fig. 808) produced is highly characteristic—the hump is formed by dorsal displacement (Fig. 808 inset, right) and by rotation of the lower fragment. An alteration in the normal relationships of the radial and ulnar styloid processes, whereby the former comes to lie at the same level as, or at a higher level than, the latter, is a reliable sign.

**Smith's Fracture** (Reversed Colles's Fracture) is similar except that the distal fragment is angulated volarwards, instead of dorsalwards. Smith's fracture, which is much less common, is caused by a sudden force transmitted through the hyperflexed dorsum of the hand, such as would be occasioned by falling and striking the dorsum, and thereby hyperflexing the wrist-joint.

**Fracture of the Radial Styloid.**—This usually occurs in young working men. Typically it is caused by forced radial deviation of the wrist as when a starting handle kicks (lorry-driver's fracture). As displacement of the fragment is uncommon the only sign is tenderness on the lateral side of the wrist.

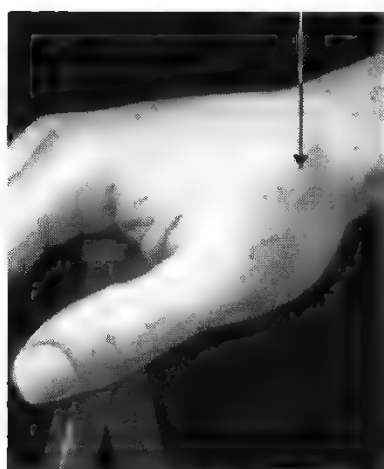
**Fracture of the Carpal Scaphoid** is the most common injury to befall the wrist of a working man—the very words 'sprained wrist' should arouse immediately a suspicion of a fractured scaphoid. Any accident that imposes violent extension

(e.g., a fall on the outstretched hand; a jerk from the starting handle of an automobile) is apt to fracture the scaphoid for, willy-nilly, the scaphoid (*Fig. 809*) opposes extension of the wrist, and when the intercarpal joint is excessively extended the scaphoid breaks.



*Fig. 809.*—The scaphoid and the lunate bones are the only carpal bones to be injured frequently, and if the clinician orientates them, the subject becomes less difficult.

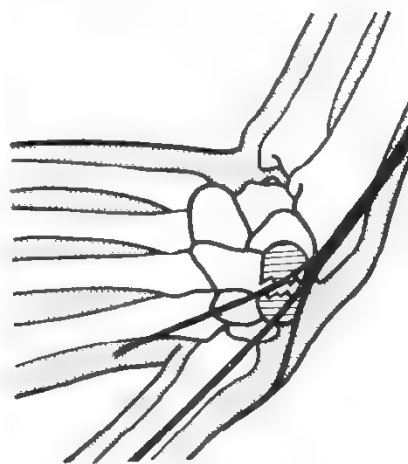
#### DIAGNOSIS OF FRACTURE OF THE CARPAL SCAPHOID



*Fig. 810.*—Soon after the injury slight localized oedema occurs, reducing or obliterating the natural concavity of the anatomical snuff-box.



*Fig. 811.*—The carpal scaphoid lies in the floor of the anatomical snuff-box distal to the tip of the radial styloid.



*Fig. 812.*—In everybody, firm finger-tip pressure in the anatomical snuff-box causes some pain, owing to compression of the radial nerve. Therefore test the uninjured side first.

*Inspection.*—Oedema appears almost at once (*Fig. 810*). It is most marked in the anatomical snuff-box. The swelling is neither great nor widespread.

*Passive Movement.*—There is pain on attempting to flex or extend the wrist-joint.

*Palpation.*—Grasp the patient's hand in your left hand, and place the tip of your right index finger in the anatomical snuff-box (*Fig. 811*); the scaphoid bone is directly beneath the palpating finger. Now deviate the patient's hand to the ulnar side; this makes the bone more accessible. Palpate again firmly; normally



firm pressure at this point causes pain, owing to compression of the radial nerve (*Fig. 812*); therefore do not jump to a conclusion until the same amount of pressure has been applied on the contralateral side. Firm finger-tip pressure in the anatomical snuff-box causing pain sufficient to make the patient wince, and of a degree that does not appertain on the contralateral side, is indicative of fracture. In a recent case these physical signs are often more reliable than radiological findings.

**Dislocation of the Lunate.**—There is considerable swelling of the wrist, and usually there are signs of carpal tunnel compression, i.e., the dislocated bone, imprisoned deep to the flexor retinaculum, prevents movements of the flexor tendons causing immobility of the semiflexed fingers and paraesthesiae in the distribution of the median nerve (*see The Carpal Tunnel Syndrome, p. 473*); the signs of a complete median nerve lesion (*see p. 416*) may become apparent. Normally the lunate occupies the hollow that can be felt on the back of the wrist immediately distal to the radius in the line of the middle finger. When the bone is dislocated, this hollow is more concave than usual, and in it lies the site of maximum tenderness. Occasionally the scaphoid is fractured, half of it accompanying the dislocated lunate. This diagnosis cannot be made without X-rays.

**Fracture of the Lunate** is much less frequent than the foregoing. The site of maximum tenderness is over the lunate (*see Fig. 809*). Extension and flexion of the wrist are greatly reduced. These are the only signs of this fracture. Little wonder that it is overlooked.

**Kienböck's Disease of the Lunate** is an avascular necrosis probably following repeated minor injury. Persistent tenderness over the lunate and limitation of movement of the wrist-joint suggest the diagnosis, which must be confirmed by radiography.

### PAIN IN THE UPPER LIMB

This is a common diagnostic riddle. Formerly cervical rib or, in its absence, the scalene syndrome, was blamed frequently and many unnecessary operations performed. The discovery of the common conditions listed below have eliminated this source of error. Having carefully excluded recent injury or angina pectoris as the cause of pain, meticulous examination along the lines suggested will usually enable the clinician to establish the diagnosis, but it should be remembered that some cases are atypical, and X-rays and a therapeutic trial may be necessary before the diagnosis can be regarded as proved.

Consider the following (in approximate order of frequency).—

- Cervical spondylosis (common), *see p. 151*;
- Supraspinatus tendinitis, *see p. 456*;
- Carpal tunnel syndrome, *see p. 473*;
- Tennis elbow, *see p. 466*;
- De Quervain's disease, *see p. 474*;
- Secondary malignant disease of bone, *see p. 435*;
- Elbow tunnel syndrome, *see p. 467*;
- Pancoast's syndrome, *see p. 195*;
- Cervical rib syndrome (rare), *see p. 147*.

## CHAPTER XXXII

## THE HAND

THE findings, particularly in infections and injuries, should be recorded graphically (see Fig. 2, p. 3). The fingers should be referred to as index, middle, ring, and little, and not by numbers, a practice which is open to misinterpretation with occasional disastrous results when the incorrect finger is amputated.

## ACUTE INFECTIONS OF THE HAND

The prompt diagnosis (and treatment) of acute infections of the hand is extremely important. Without a knowledge of the signs that typify the various lesions, correct treatment is impossible, and unnecessary loss of working time and crippling deformities follow. Observe the inflamed hand:—

**Posture.**—When a hand is seriously inflamed it takes up the position of greatest ease, which is, in fact, the position of rest (Fig. 813) (Wood Jones).

Fig. 813.—The position of rest for the hand. The index finger is less flexed than the other fingers.

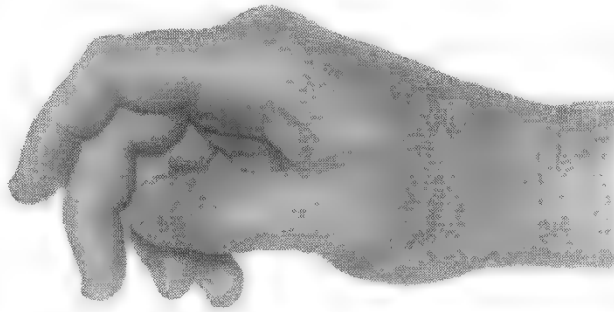


Fig. 814.—Oedema of the back of the right hand is very common in infections of the palmar aspect. Another example of the value of comparison.

**Swelling.**—A fundamental principle is that *the greatest swelling does not necessarily indicate the position of the pus, if such be present*. Oedema is an outstanding feature of all varieties of acute infections of the hand. Because the rich network of lymphatics in the subcutaneous tissues of the dorsum receives efferent vessels from the palm, and because the skin covering the back of the hand is loose and elastic, oedema is often most in evidence on the dorsum (*Fig. 814*), irrespective of the site of the lesion.

**The Lymphatic Field of the Hand.**—After the local examination, always palpate the supratrochlear lymph-node (*see p. 466*) and the axillary lymph-nodes (*see p. 177*) on the side of the lesion.

#### POORLY LOCALIZED SUBCUTANEOUS INFECTIONS

**Lymphangitis.**—Organisms gain entrance through an abrasion that may be so minute as to be imperceptible. Within a few hours the adjacent portion of the hand becomes swollen and painful, and there is often considerable elevation of the temperature. Oedema, most in evidence on the back of the hand, comes on early. A little later, red streaks, so characteristic of lymphangitis (*see Fig. 77, p. 35*), can be seen coursing up the arm. Especially in lesions of the ulnar half of the hand, the first lymph-node to become enlarged and tender is the supratrochlear. The lymphatics of the thumb and index finger pass straight to the axillary nodes. Lymphangitis can occur without any other demonstrable manifestation of inflammation, or as an accompaniment of one of the local inflammatory entities to be described.

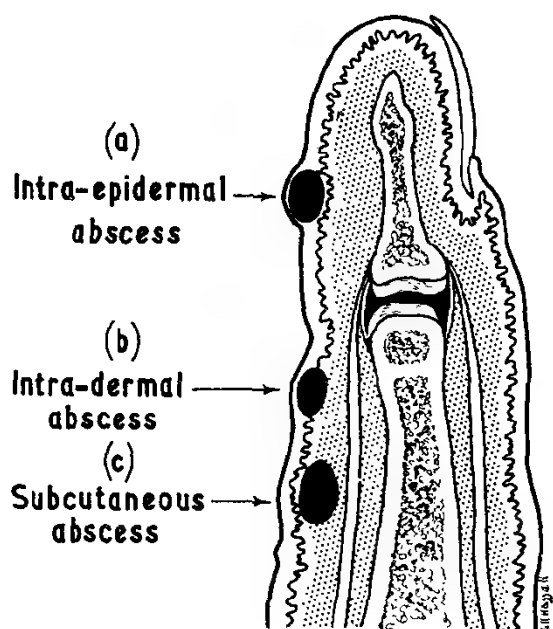
**Cellulitis** is the initial lesion of the fascial-space infections to be described. In a proportion of cases, higher in loose subcutaneous than in more confined spaces, the inflammation resolves. In the rest a localized abscess forms. Incision during the stage of cellulitis is highly mischievous. On the other hand, *fluctuation must not be awaited in infection of closed and deep spaces*. In these swelling, induration, and localized tenderness signify that pus is present.

#### WELL-LOCALIZED INFECTIONS

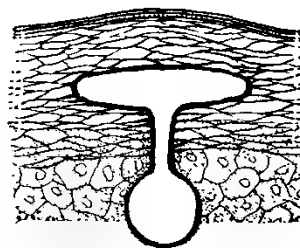
**Intracutaneous and Subcutaneous Abscesses** are very common. The volar surface of the hands (including the fingers) of manual workers often is covered with greatly thickened epithelium. Especially in these persons, intracutaneous infections are liable to occur, in which event there may or may not be a history consistent with local implantation of organisms. Signs of local inflammation appear and soon the epithelium is lifted by a collection of pus.

**An Intracutaneous Abscess** can be situated in the *epidermis*, where it forms an obvious purulent blister (*Fig. 815 (a)*), or in the *dermis* (i.e., beneath the Malpighian layer of the skin), in which event an obvious dome-shaped elevation is lacking (*Fig. 815 (b)*), but unless the skin is pigmented or heavily ingrained with dirt, the pus can be seen through the epidermis as an indistinct opacity. The importance of an intra-epidermal abscess lies in the fact that it may represent the superficial component of a *collar-stud abscess* (*Fig. 816*), the deeper component of which is commencing to burrow and spread. There is no means of telling if there is a deeper loculus until the superficial component has been uncovered.

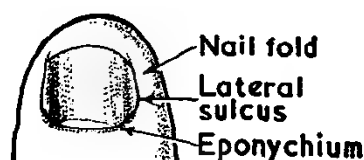
A **Subcutaneous Abscess** (*Fig. 815 (c)*) does not proclaim its presence so obviously: the cellulitis, which is its precursor, gives place to a less sharply localized swelling and the formation of pus is surmised from the induration and extreme tenderness.



*Fig. 815.*—Superficial abscesses at various levels.



*Fig. 816.*—Epithelial collar-stud abscess, showing the superficial locus lying between the layers of the epidermis of a horny-handed manual worker.



*Fig. 817.*—The parts concerned in paronychia.

**Paronychia\*** is the most common infection of the hand (30 per cent). Unlike the others, which occur more frequently in working men, it is encountered in every walk of life, in both sexes, and from infancy to old age. The infection arises from a hang-nail, careless nail paring, or a manicurist's unsterile instrument. The inflammation commences beneath the eponychium (called by manicurists the 'cuticle'). Usually suppuration follows. Confined by the adherence of the eponychium (*Fig. 817*) to the base of the nail, the inflammation advances around the nail fold, even to the contralateral side. In 60 per cent of cases pus burrows beneath the base of the nail (*subungual abscess*).

The diagnosis can be made by inspection alone (*Fig. 818*). If pus is present, light pressure on the inflamed area, or (when pus is present beneath the nail) on the nail itself, evokes exquisite pain.

**Apical Space Infection.**—The infection is confined at first to the space between the distal quarter of the subungual epithelium and the periosteum. Frequently the pus bursts through the subungual epithelium to lie beneath the distal portion of the nail (*Fig. 819*). Usually the space becomes infected by running a sharp object under the free edge of the nail into the 'quick'. Although exquisitely painful, there is comparatively little swelling. This not uncommon condition is often confused with terminal pulp-space infection, but unlike the latter, tenderness is greatest at, or just proximal to, the free edge of the nail. Sometimes there is redness extending along one or both of the lateral nail-folds, and even prolonged into the eponychium at the base of the nail. In these circumstances, unless the area of greatest tenderness is

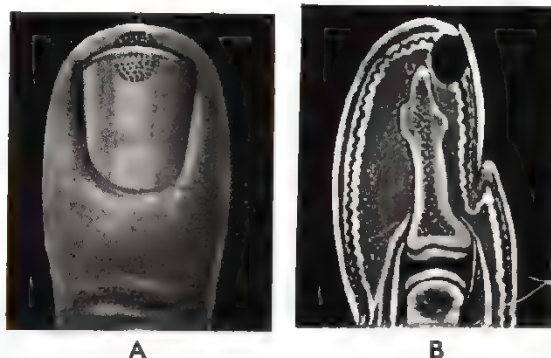
\* *Paronychia*. Greek, *παρά* = near + *ὄνυξ* = the nail.

defined, paronychia is likely to be diagnosed. Pus comes to the surface either just distal to, or just beneath, the free edge of the nail (*Fig. 819 B*).

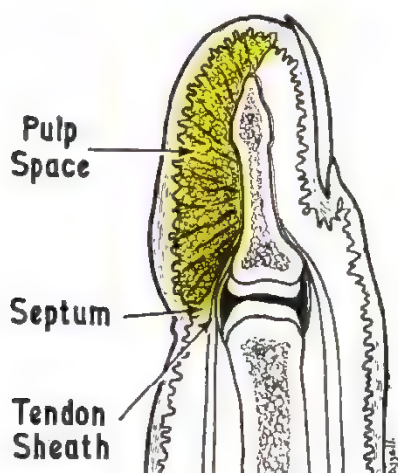
**Infection of the Terminal Pulp-space** is common and serious. The digital pulps are subjected to more pricks than any other part of the body, index and thumb being affected most often.



*Fig. 818.*—Paronychia. Often infection occurs as in this case, through a 'hang-nail'.



*Fig. 819.*—Location of an apical space abscess. *A*, As seen clinically from in front. *B*, The abscess cavity seen in sagittal section.



*Fig. 820.*—The confines of the terminal pulp-space. It is separated from the rest of the finger by a fascial septum, at the level of the epiphysial line of the terminal phalanx.



*Fig. 821.*—Exuberant granulation tissue following delayed healing of an incision to drain an infected terminal pulp-space.

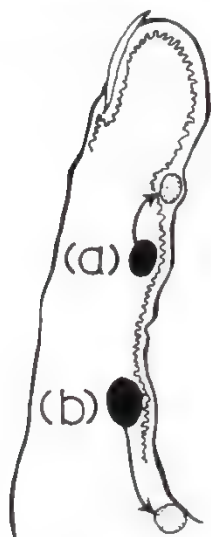
The pulp of the distal segment of a digit is a closed fascial space; it is closed proximally by fusion of the dermis of the distal flexion crease with the deep fascia, which in turn is attached to the periosteum just distal to the insertion of the long flexor tendon (*Fig. 820*). When this space becomes infected tight fixation of the dermis to the fascia, and the fascia to the bone, so interferes with swelling of the parts concerned that the tension within the space, which is filled with compact fat feebly partitioned by fibrous septa, becomes extreme. Sometimes the tension is so great that not only does necrosis of soft tissue occur, but as a result of thrombosis of the vessels traversing the space, necrosis of the terminal phalanx results.

Dull pain and swelling are the first symptoms. By the third day there are severe nocturnal exacerbations of throbbing pain, interfering with sleep. Light



pressure over the affected pulp increases the pain. If the pulp is indurated, and has lost its normal resilience, pus is present. Untreated, the abscess tends to point towards the centre of the pulp beneath a patch of devitalized skin. A collar-stud abscess then occurs; still untreated, the abscess bursts. When, following drainage of the space, the wound continues to discharge and becomes filled with exuberant granulation tissue (*Fig. 821*) it is quite certain that necrosis of the terminal phalanx has occurred and this can be confirmed by radiography.

**Infection of the Middle Volar Pulp-space.**—In this instance also, the infection follows direct implantation of organisms by a prick, and if the inflammation cannot be controlled, because this, too, is a closed space shut off above and below at the flexion creases, pus under tension causes symptoms and signs similar to those described in connexion with the terminal pulp-space. The



*Fig. 822.*—The direction of spread of an abscess of (a) The middle volar pulp-space; (b) The proximal volar pulp-space.



*Fig. 823.*—Infection of the web space between the index and middle fingers.

finger is held in semiflexion: in about one-third of cases an attempt to straighten it is painful. There is tender induration over the space, and while to some extent the terminal and proximal spaces share in the swelling of the digit, palpation over these reveals neither acute tenderness nor induration.

*In Early Cases* it is difficult, and sometimes impossible, to distinguish infection of the middle volar pulp-space from infection of the underlying flexor tendon-sheath; however, in the former, extreme tenderness over the base of the tendon-sheath (*see Fig. 829*) is lacking.

*In Late Cases*, due to the tracking of pus, frequently a purulent bleb appears in the distal flexion crease (*Fig. 822 (a)*).

**Infection of the Proximal Volar Pulp-space** (*Fig. 822 (b)*).—While this space is well partitioned from the middle space distally, proximally it communicates freely with the web space. Once localization has occurred, infection of this space is comparatively easy to diagnose. There is tender induration in this segment of the digit, and frequently a web space becomes involved also (*Fig. 823*).

**Web-space Infection.**—The three interdigital web spaces are filled with loose fat that bulges between the four divisions of the palmar fascia. Infection often results from a purulent blister on the forepart of the palm.

Constitutional symptoms are usually severe; consequently patients with this condition are often seen before localization of the infection has occurred. At this stage there is gross oedema of the back of the hand, and although web-space infection can be strongly suspected from the location of the tenderness, it is often

difficult to rule out tenosynovitis. Once localization has occurred the involved fingers are separated (*Fig. 823*). In addition to the area of redness shown, there is often a fan-shaped blush on the dorsum extending from the web. The maximum tenderness is found on the volar surface of the web and at the base of one or other of the fingers that flank the affected web. Untreated, pus can track across the volar surface of the base of a finger from one web space into the next web space: also it can track up the side of the proximal volar pulp-space of a related digit.

**Carbuncle of the Hand.**—The dorsal aspect of a proximal segment of a digit and the dorsum of the hand (*see Fig. 68, p. 31*) are not uncommon sites, much more frequently in the male because in adult males these areas are often hairy. In either situation the underlying extensor tendon is liable to be involved.

#### SERIOUS HAND INFECTIONS

These are now infinitely less common than the conditions detailed above. Sometimes they follow a neglected minor infection. When the hand is seriously inflamed it takes up the position of rest (*see Fig. 813*).



*Fig. 824.*—'Ballooning' of the thenar eminence (right hand): the sign of an infected thenar fascial space.

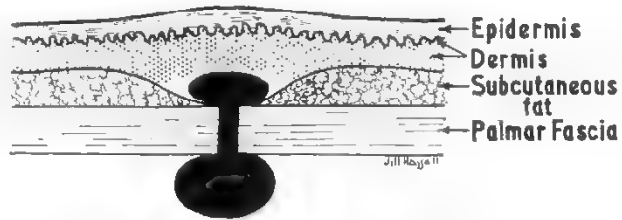
**Infection of the Thenar Space.**—This space can be looked upon as a large web space between thumb and index finger. Infection gives rise to the typical 'ballooning' of the thenar eminence, which is quite characteristic (*Fig. 824*). Flexion of the distal phalanx may be pronounced, but it lacks the resistance to extension that is present in tenosynovitis of the flexor pollicis longus.

**Deep Palmar Abscess** (Mid-palmar space infection).—Pus is situated beneath the thick, strong, resistant palmar fascia. Usually it follows a penetrating injury, but it can result from the bursting of an undrained infected flexor tendon-sheath of the index, middle, or ring fingers. Swelling of the back of the hand is extreme. Obliteration of the concavity of the palm with even slight bulging thereof is pathognomonic. By reason of swelling, a very great enlargement of the hand results—it

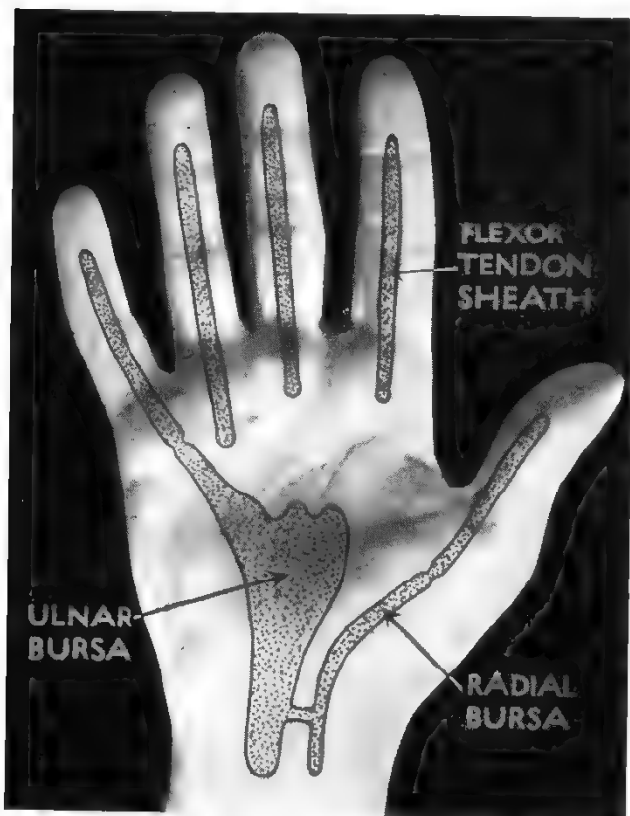
has been likened to a whale's flipper. When the abscess is due to a penetrating wound it decompresses itself along the path of wound infliction and a collar-stud abscess (*Fig. 825*) results, the superficial loculus of which lies beneath the thick fibro-cellular layer of the dermis (there is no subcutaneous space in the centre of the palm).

**Acute Suppurative Tenosynovitis.**—

Infection is usually by the prick of a sharp-pointed object such as a needle, a thorn, or the dorsal fin of a fish, the point of entry being within the territory overlying one of the flexor tendon-sheaths (*Figs. 826, 827*). Often the prick is in one of the digital flexion creases—here the tendon-sheath is remarkably near the surface. Exceptionally, infection occurs by pus burrowing through the strong proximal septum (*see Fig. 820*) of the terminal pulp-space, or as a result of



*Fig. 825.*—Deep palmar abscess with an extension along the path of the original puncture resulting in a collar-stud abscess.



*Fig. 826.*—Showing the relationship of the flexor tendon-sheaths to the creases of the fingers and palm. In 11 per cent of cases the sheath of either the index, middle, or ring finger, or combinations of these, communicates with the ulnar bursa (Scheldrup).



*Fig. 827.*—Showing the relationship of the flexor tendon-sheaths to the bones of the hand.

an ill-placed incision to give exit to pus previously confined to that space. The whole sheath is rapidly involved. Within a few hours of the injury throbbing pain is experienced in the affected digit, and the patient's temperature rises.

**Flexion of the Finger.**—Typically the finger is held in a flexed position. This is an early sign at a stage when diagnosis and treatment are most desirable.

*Swelling.* —There is symmetrical swelling of the whole finger in late cases (*Fig. 756*); soon the back of the hand becomes puffy.

*Active Movement.*—Ask the patient to move the fingers. Note particularly that while the patient with a suppurative tenosynovitis refrains from, and indeed is incapable of, flexing the infected finger, that finger is not held rigidly immobile. On the contrary, owing to contraction of the relevant lumbrical and interosseous muscles, to-and-fro movement at the carpometacarpal joint occurs. This may beguile the clinician, who assumes that such movement excludes a diagnosis of acute tenosynovitis.



*Fig. 828.*—The '*signe du crochet*'. The affected finger being in semiflexion, any attempt by the examiner to straighten it is resisted, and accompanied immediately by intense pain.

*Passive Movement.*—Gently—exceedingly gently—extend the suspected finger. Similarly, test the other digits. Exquisite pain is produced by the slightest attempt at extension (*Fig. 828*) of the infected digit or digits.

In infection of the volar pulp-spaces (*see p. 483*) extension of the affected finger may produce pain, but never the exquisite pain of tenosynovitis.

*The Site of Maximum Tenderness* must be ascertained, and while the search is in progress it is essential to be able to visualize the surface anatomy of the tendon-sheaths and their connexions (*Figs. 826, 827*). Ask the patient to lay his hand upon a table in the most comfortable position possible, palm upwards. The site of maximum tenderness is found by palpating systematically with some blunt-pointed instrument: a match-stick answers the purpose admirably (*Fig. 829*). Having now identified the tendon-sheath involved, if a point of superlative tenderness is located over the proximal cul-de-sac of the index, middle, or ring finger, it is certain that suppurative tenosynovitis is present.

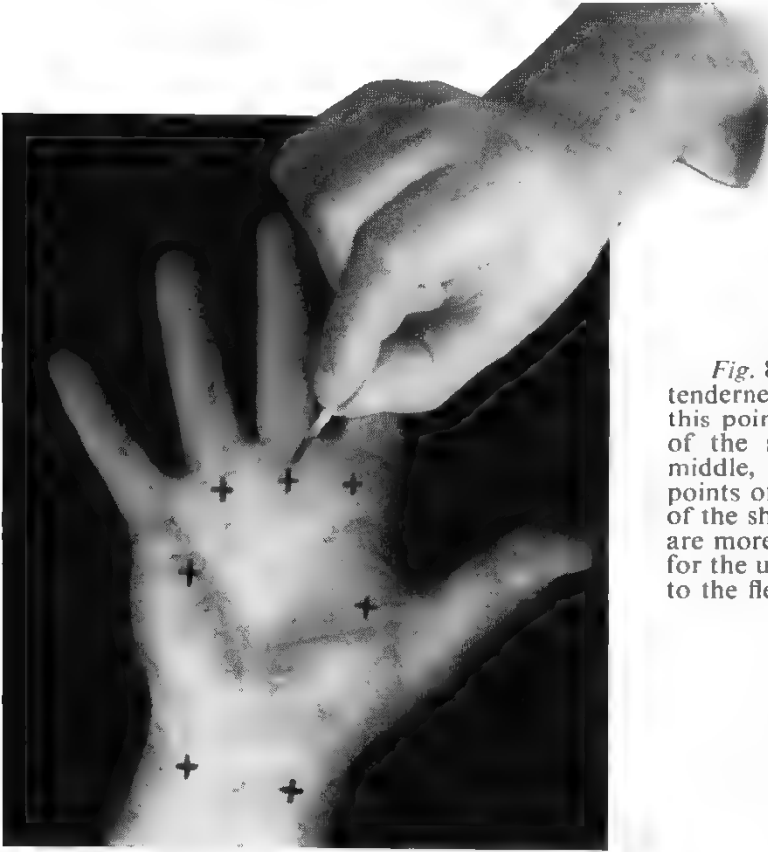
**Localized Infected Tenosynovitis** is relatively common owing to early antibiotic treatment limiting the infection to a portion of the sheath by adhesions. Swelling and tenderness are confined mainly to one segment of the digit, rendering the differential diagnosis from infection of a middle or proximal volar pulp-space very difficult. Exploration is indicated if the condition does not soon settle completely with antibiotics.

**Involvement of the Ulnar or the Radial Bursa**, although comparatively rare since the introduction of antibiotics, is always a very serious matter.

*Signs of Involvement of the Ulnar Bursa.*—(1) Flexion of a finger (usually the little finger but, as noted in the caption to *Fig. 826*, the other sheaths may communicate

with the ulnar bursa); (2) Fullness of the palm; (3) Fullness immediately proximal to the flexor retinaculum on the ulnar side; (4) A point of maximum tenderness in this position (*Fig. 829*).

*Signs of Involvement of the Radial Bursa.*—(1) Flexion of the thumb; (2) Tenderness over the flexor pollicis longus sheath (*Fig. 829*); (3) Swelling just proximal to the flexor retinaculum on the radial side.



*Fig. 829.*—Seeking the point of maximum tenderness. In suppurative tenosynovitis this point is over the cul-de sac at the base of the sheath in the case of the index, middle, and ring fingers. The maximum points of tenderness in the case of infection of the sheaths of the thumb and little finger are more proximal in the palm, while those for the ulnar and radial bursae are proximal to the flexor retinaculum (*After Kennon.*)

Remember that the radial and ulnar bursae communicate in over 80 per cent of cases. Reference to *Fig. 826* is again advised. Thus it may be difficult to distinguish infection of one bursa from the other. In many instances, both are infected.

**Infection of the Dorsal Space.**—The frequency with which pitting oedema accompanies pus in the palmar aspect of the hand has resulted in neglect of an appreciation of the dorsal fascial spaces as sites of infection. The most frequent causes of dorsal space infection are a boil of the overlying skin and a penetrating wound. Infection of the dorsal subcutaneous space of the hand is fairly common, as also is that of the corresponding space in the proximal segment of the digits: that of the dorsal subaponeurotic space is rare. If swelling of the dorsum accompanied by tenderness, induration, and perhaps redness is present, a diagnosis of infection of the dorsal space can be made with assurance.

### OCCUPATIONAL AFFECTIONS OF THE HAND

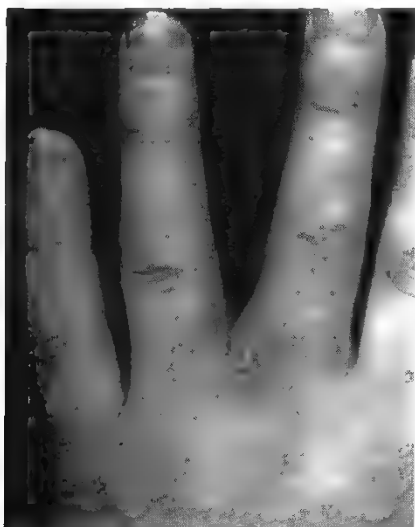
For the most part conditions coming into this category are chronic infections.

**Chronic Paronychia** seldom follows acute paronychia as it is a fungus infection: the onset is insidious with a history dating back months rather than days. The lesions are often multiple. In days gone by washerwomen were especially prone to this condition; today the housewife who does not wear rubber gloves when



'washing up' is the usual sufferer. Another possibility is vascular insufficiency, e.g., Raynaud's disease (*see* p. 392). There is little tenderness. The eponychium is glazed and faintly pink without the redness of acute paronychia or frank pus. The nail itself may be affected, being ridged and sometimes pigmented.

**Barber's Pilonidal Sinus.\***—When clipped, hairs have a cut edge bevelled like the tip of a hypodermic needle and can penetrate the skin, generally in the digital web between the middle and ring fingers of the right hand (*Fig. 830*): the clippings must have penetrated the skin because there



*Fig. 830.*—Interdigital pilonidal sinus in a barber.



*Fig. 831.*—Grease gun injury; the appearance of the finger soon after the accident.

are no hair follicles in the web. In the uninfamed state the lesion is characterized by a small black dot (which marks the orifice of the sinus) situated towards the dorsum of the affected cleft. When the skin over the visible lesion is picked up between the examiner's finger and thumb, a nodule can be palpated. In four out of five cases the lesion is multiple. Like its counterpart in the sacro-coccygeal region (*see* p. 282), the sinus is the seat of recurrent acute or subacute inflammation. Female hairdressers sometimes develop these lesions in the interdigital clefts of the toes: at work in hot weather they sometimes wear sandals and no stockings.

**Grease or Spray Gun Injuries.**—A car mechanic, or other worker with this type of instrument, accidentally injects oil under high pressure into a finger or the hand. Urgent surgical treatment is mandatory if serious loss of function is to be avoided. Immediately after the accident the part feels numb and is pale and swollen (*Fig. 831*). The entry wound is inconspicuous with little or no bleeding. The appearances are suggestive of a space infection if the oil is localized in one of the sites described on pp. 484–7 (including tendon-sheaths), or of a poorly localized infection if not so localized, but a cardinal sign of inflammation is absent; *the part feels cold*.

**Digital Hunterian Chancre.**—When a painless, elevated indurated sore appears on a finger, especially the right index finger, and the supratrochlear lymph-node is considerably enlarged, remember the Hunterian chancre (*see* p. 385). Dental surgeons, doctors, and midwives nowadays rarely acquire this infection in the course of their work. 'The primary lesion of syphilis, when it develops on parts of the body other than the genitalia, is protected from recognition by a singularly low threshold of suspicion on the part of clinicians' (Stokes).

**Verruca Necrogenica** (butcher's wart; pathologist's wart) is due to inoculation with *Mycobacterium tuberculosis* through a breach of continuity of the skin. Formerly milkmaids were

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\* In Australia a similar condition is found in sheep-shearers.

prone to this condition, which they acquired from handling tuberculous udders. It commences as a bluish-red patch; later its surface becomes elevated and papillomatous (*Fig. 832*). If squeezed, pus oozes from between the warty projections. It should be suspected if a patient presents with a small warty mass surrounded by pustules, usually on the dorsum of the hand.

**Erysipeloid** (*see p. 32*).

### OTHER LESIONS OF THE SOFT TISSUES OF THE HAND

**Syndactyly** (webbed fingers) (*Fig. 833*) are a congenital and an hereditary condition. Two or more fingers may be involved. Ascertain whether the webbing involves skin only, or whether, in addition, there is fibrous or even bony union.

**Implantation Dermoid.**—Because the digits are pricked frequently—especially the pulps of the fingers—an implantation dermoid cyst is encountered more often in this region than elsewhere. Under the skin there is a painless, soft cyst (*Fig. 834*), which is neither attached to the skin (which is normal) nor to the deeper structures. The inference is that at some previous time a fragment of epidermis was driven beneath the dermis and continued to proliferate.

**Compound Palmar Ganglion.** This is not a ganglion, as understood by the term at the present time: formerly simple ganglia were thought to arise in tendon-sheaths—a hypothesis for which there is no foundation. ‘Compound palmar ganglion’ is an old term to signify tuberculous tenosynovitis of the ulnar bursa, but at present a tuberculous aetiology seldom can be substantiated.



*Fig. 832.*—Verruca necrogenica (butcher's wart).



*Fig. 833.*—Syndactyly.

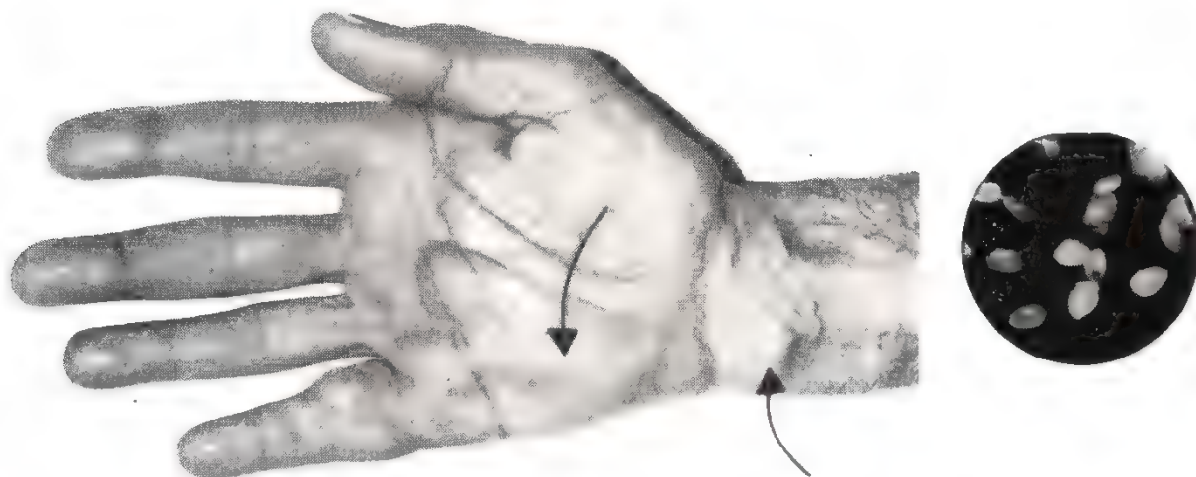


*Fig. 834.*—Implantation dermoid following a human bite.

Some are associated with rheumatoid arthritis. In cases of some standing the fingers are partially flexed and there is an hour-glass-shaped swelling bulging above and below the flexor retinaculum. Transmitted fluid impulse can be elicited from one compartment of the swelling to the other (*Fig. 835*), and very characteristic

is the soft crepitant sensation derived from the movements of the melon-seed bodies which abound within the bursa.

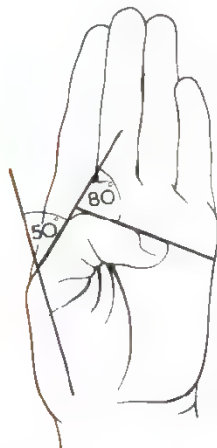
**Ganglion of a Digit** is not uncommon on the volar surface beneath a digital flexion crease. The small tense swelling is often mistaken for a sesamoid bone. A giant-cell tumour of the synovial sheath is indistinguishable clinically. More rarely, a ganglion appears on the dorsal surface of a finger in relation to an interphalangeal joint, when it is likely to be confused with a Heberden's node (*see p. 495*).



*Fig. 835.*—Compound palmar ganglion. Transmitted fluid impulse accompanied by a peculiar crepitant sensation (due to the movement of melon-seed bodies) could be obtained between the positions marked by the arrows. Also shown are melon-seed bodies found at operation.



*Fig. 836.*—Glomus tumour in the nail-bed of the thumb.



*Fig. 837.*—Flexion of the thumb. Angles of  $80^{\circ}$  at the interphalangeal joint,  $50^{\circ}$  at the metacarpophalangeal joint and  $15^{\circ}$  at the carpometacarpal joint are normal.



*Fig. 838.*—Early Dupuytren's contracture affecting the slip of palmar fascia to the ring finger.

**Glomus Tumour** is a small, firm, smooth nodule, rarely more than a few millimetres in diameter. Most examples involve the nail-bed, and present as an exquisitely tender red, or violet-coloured, localized area beneath the nail (*Fig. 836*). It can be distinguished from a haemangioma by the fact that the latter is not tender and blanches when pressure is applied. Some cases show disuse

atrophy of the digit. A glomus tumour is derived from a glomus body—an arteriovenous anastomosis incorporating muscle and nerve tissue and present mainly in the skin and subcutaneous tissues of the hands and feet, but most numerous in the hands, and especially in the nail-beds. The glomera are believed to help in regulating body temperature.

#### FLEXION DEFORMITIES OF THE FINGERS

**Testing Movements of Fingers and Thumb.**—The Neutral Position is regarded as that with the fingers straight and the thumb lying next to the index finger. Normally each finger can be flexed so that each joint bends to approximately a right angle (*see Fig. 847*). Hyperextension of  $45^\circ$  at the metacarpophalangeal joint is also possible normally. Abduction and adduction of the fingers is measured from the midline of the middle finger ('finger spread') and varies depending on the size of the hand. Compare it with the normal side.

Thumb movements are more complex. Extension is movement away from the index finger on a flat surface with the hand supine and palm upwards, the angle normally reaching  $70^\circ$ . Normal flexion is shown in *Fig. 837*. The angle of abduction (normal  $70^\circ$ ) is that between thumb and index metacarpals with the hand supine, the thumb being raised toward the ceiling (*see Fig. 722*, p. 417).

**Dupuytren's Contracture.**—Occurs usually in males (10:1). The palmar fascia\* is obviously thickened and contracted. At an early stage this thickening takes the form of one or more nodules in the palm, and often when the fingers are extended fully a dimple is seen (*Fig. 838*) indicating that the contracted fascia is adherent to the skin. While typically the condition affects the ring finger (*Fig. 839*) and years later the little finger becomes implicated, in about one-third of cases it is the little finger that is affected primarily (Early).

**Congenital Contracture of the Little Finger** is frequently bilateral and is the result of contracture of all the soft tissues (*Fig. 840*) and is similar to Dupuytren's contracture: it is the absence of thickening of the palmar fascia that leaves no doubt as to which of these two conditions is present. Involvement of other fingers is rare.

**Flexor Tendon Adhesions.**—Should the flexed finger be the aftermath of suppurative tenosynovitis (*see p. 485*), on testing both active and passive movements it will be found that neither extension nor flexion is possible except at the metacarpophalangeal joint. More than one finger may be affected. Usually there is a clear history of a severe hand infection.

**Volkman's Ischaemic Contracture** is due to vascular injury which results in muscle infarction and muscle-fibre death. Later the lifeless muscle-fibres are replaced by fibrous tissue. Obviously, therefore, it is of the highest importance to focus attention on the early signs of muscle ischaemia, so that the clinician can remove the cause while the muscle is still viable.

**Stage of Ischaemia.**—Half the battle is to know the circumstances in which muscle ischaemia is prone to occur. First and foremost, it results from a too-tight plaster cast or, much less frequently, too-tight bandaging. Secondly, it can occur as a result of arterial damage by a fracture. Lastly, it can arise as a result of the intense arterial spasm that follows the accidental injection of certain drugs, notably thiopentone, into an artery in mistake for a vein. *See also Arterial Trauma*, p. 396 and *March Gangrene*, p. 537.

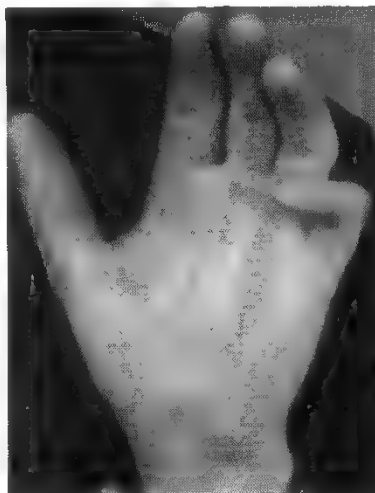
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\* In about 5 per cent the plantar fascia of one or both feet is affected similarly (*see p. 552*).

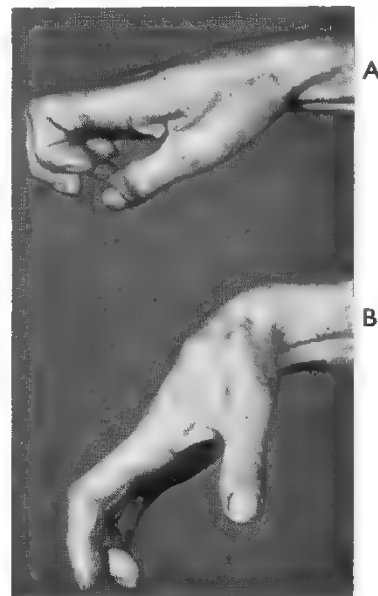
The early signs are *pain*, *pallor*, *puffiness* (oedema), *pulselessness*, and *paralysis* (Griffiths). As a rule, the first symptom or sign appears within a few hours of injury or the reduction of a fracture. The onset can be delayed for as long as 24 hours, or even more. Pain in the forearm on passive extension of the fingers (*Fig. 842*) is the first serious early sign, as is the assumption of a flexed position. Blue,



*Fig. 839.*—Dupuytren's contracture of many years' standing.



*Fig. 840.*—Congenital contracture of the little finger.



*Fig. 841.*—Showing: *A*, Volkmann's contracture; *B*, That the fingers can be partially extended by flexing the wrist.



*Fig. 842.*—It should be routine to test for pain on finger extension in all patients with the arm in plaster-of-Paris.



*Fig. 843.*—The anatomy of the insertion of extensor digitorum communis.

swollen fingers are by no means invariable: pallor of the hand is not an infrequent early sign. The radial pulse is absent constantly in all severe cases during the first three or four days, and the skin temperature of the affected hand is reduced.

*The Stage of Contracture* follows untreated ischaemia, or when effective treatment is commenced too late. In the case of the forearm, the fingers are flexed but they can be, at least partially, extended when the wrist is flexed (*Fig. 841*). This demonstrates that the contracture is in the flexor group of muscles. In extreme cases a complete 'claw-hand' (*see p. 420*) can result.

**Burns Contracture.**—If the history can be elicited, the conclusion that badly treated burns are the cause of contractures becomes obvious.

**Rupture of the Extensor Tendon of a Digit.**—Recall the mode of insertion of the



extensor digitorum communis (Fig. 843). There are two varieties of rupture of the tendon; the first is much the more common.

*a. Rupture or Avulsion of the Terminal Lateral Slips* occurs as a result of a violent blow on the tip of the finger, as might be occasioned by a cricket-ball. The resulting rupture gives rise to a clinical entity:—

**Mallet Finger** (known in the U.S.A. as 'baseball finger') (Fig. 844), which is so characteristic that it cannot be mistaken. It can also be due to an avulsion fracture of the base of the terminal phalanx.

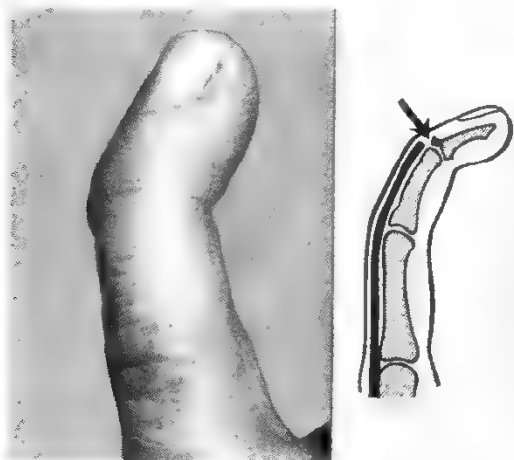


Fig. 844.—Mallet finger. The terminal phalanx cannot be extended because the insertion of the extensor tendon has been torn.

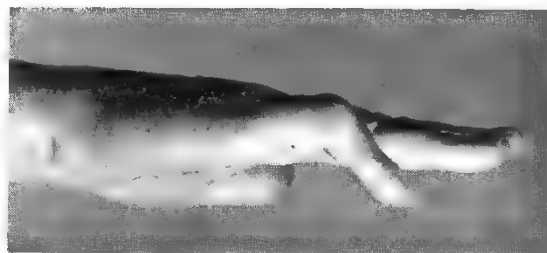


Fig. 845.—A button-hole rupture of the middle slip of the extensor tendon of the little finger.

*b. Button-hole Rupture of the Extensor Tendon at the Proximal Interphalangeal Joint.*—In this variety of extensor tendon rupture it is the middle slip of the tendon that is torn or avulsed from the base of the middle phalanx. The proximal interphalangeal joint cannot be extended fully (Fig. 845), and when it is flexed further some-

times there is a click as the two lateral slips of the extensor expansion jerk sideways over the head of the proximal phalanx (Griffiths). If this click is heard or felt, it must be distinguished from that of a trigger finger proper.

**Trigger Finger.**—A usually palpable nodular thickening, not due to trauma, develops in the long flexor tendon opposite the head of the metacarpal. It occurs most frequently in middle-aged women. The middle or ring finger is most often affected. The 'click' to which it gives rise when the finger springs back into position is often thought by the patient to occur on the extensor aspect, which is not the case. The powerful flexor muscles can pull the bulbous portion of the tendon (the cause of the node in the tendon is unknown) down the tendon-sheath into the palm, but when they relax, the extensor mechanism is unequal to the task of accomplishing the process in the reverse direction (Fig. 846). The lump cannot enter the digital sheath without outside assistance, the entrance to the sheath being narrower than the sheath itself. Straightening of the finger is achieved by a momentarily painful snap.

**Snapping Thumb** is similar. The patient is *usually under 2 years of age*, and the mother is concerned because the infant's thumb becomes fixed in flexion. On the flexor surface over the head of the metacarpal a relatively large orange-pip-like swelling can be felt. Upon gently extending the digit, extension is brought about with a 'click'.

**Attrition Rupture of the Extensor Pollicis Longus** occurs most often in a middle-aged woman who, while wringing clothes or playing the piano, experiences sudden pain in the base of the thumb, and the thumb falls limply adducted across the palm. The terminal joint is flexed and cannot be

extended. It is usually due to rheumatoid arthritis but also occurs as an occasional complication of a Colles's fracture. It can occur as early as three weeks (while the wrist is still in plaster), or as late as four months after the injury: the tendon ruptures because it has become frayed in its groove.



Fig. 846.—Trigger finger. After closing her hand the patient was asked to open it, with this result; only when the ring finger was assisted could it be extended: a mere touch towards unflexing and the finger snapped into line with the others.

### INJURIES OF THE TENDONS OF THE HAND

Here we are dealing with a patient with a recent incised or lacerated injury of the wrist or hand, or a person with a defect of finger movement noticed remotely after a wound.

Consider the following two groups:—

1. The lesion is, or was, at the wrist, or in the palm, or over the dorsum of the hand; several tendons may have been divided together with, in front of the

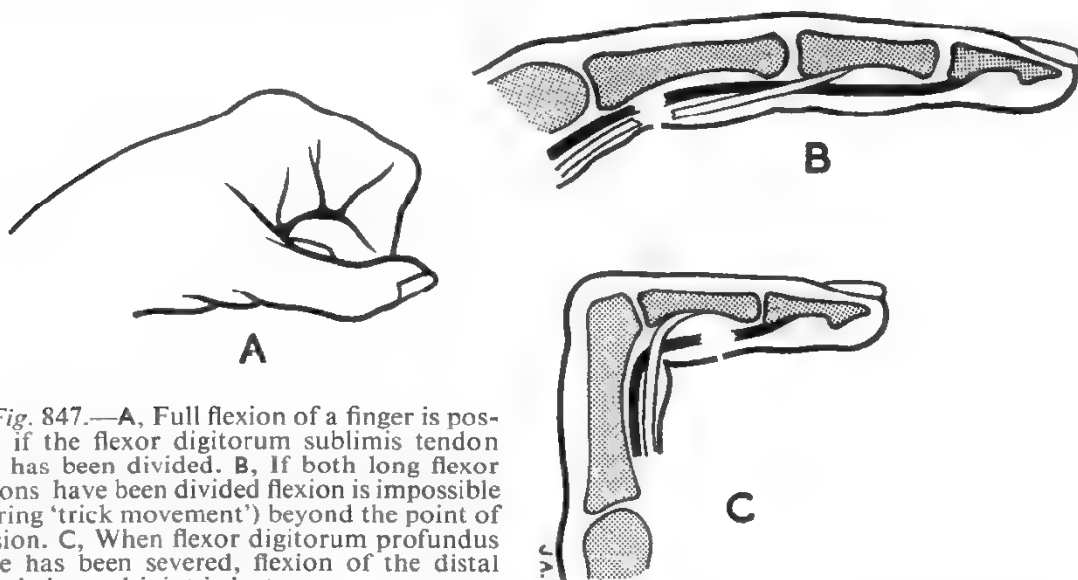


Fig. 847.—A, Full flexion of a finger is possible if the flexor digitorum sublimis tendon only has been divided. B, If both long flexor tendons have been divided flexion is impossible (barring 'trick movement') beyond the point of division. C, When flexor digitorum profundus alone has been severed, flexion of the distal interphalangeal joint is lost.

wrist, the median or ulnar nerve. Diagnosis of the nerve injury is dealt with on pp. 416–20. If only a single tendon is involved, the case falls into the second category discussed on the next page.

*Can the Patient flex the Fingers and Thumb fully?* If not (and nerve injury and fractures have been excluded), the long flexor tendons to the particular digits

have been divided. Remember that the flexor digitorum *sublimis* is *superficial* to the profundus from the carpal tunnel to the middle phalanx, and that it alone can be severed in this region without loss of function. As suture in such circumstances is not indicated, it is not important if the diagnosis is missed.

*Can the Patient extend the Fingers and Thumb fully?* If not, unless another lesion is present causing wrist drop (*see p. 415*), the relevant extensor tendons have been divided.

In practice the above tests may not be applicable if there has been severe mutilation. Accurate diagnosis must be reached on careful exploration at the necessary operation under a general anaesthetic. On the other hand, with lesser injuries, if tendon damage can be excluded confidently, all that may be necessary is skin suture under local anaesthetic.

2. The lesion is, or was, in a finger, or is, or was, a short incision in the palm, or on the dorsum, which has only involved a single tendon.

*Test Flexion and Extension as above.* (Also test pain sensation in the affected finger—suture of a severed digital nerve is well worth while.)

If the superficial flexor sublimis tendon to a finger only has been divided, there is no loss of flexion (*Fig. 847 A*). Repair is unnecessary.

If both long flexor tendons have been divided, flexion of the finger is lost, commencing at the joint distal to the lesion (*Fig. 847 B*).

If the flexor profundus has been severed distal to the proximal interphalangeal joint (*Fig. 847 C*), the patient is unable to flex the terminal phalanx.

When the flexor pollicis longus has been divided, the patient is unable to flex the thumb distal to the point of injury.

Division of an extensor tendon is also straightforward—the patient cannot extend the digit at the joint beyond the lesion *with this exception*: division of the middle slip of insertion over the proximal interphalangeal joint gives rise to the typical button-hole deformity (*see Fig. 845*). *See also Mallet Finger (p. 493)*.

## LESIONS OF THE BONES AND JOINTS OF THE HAND

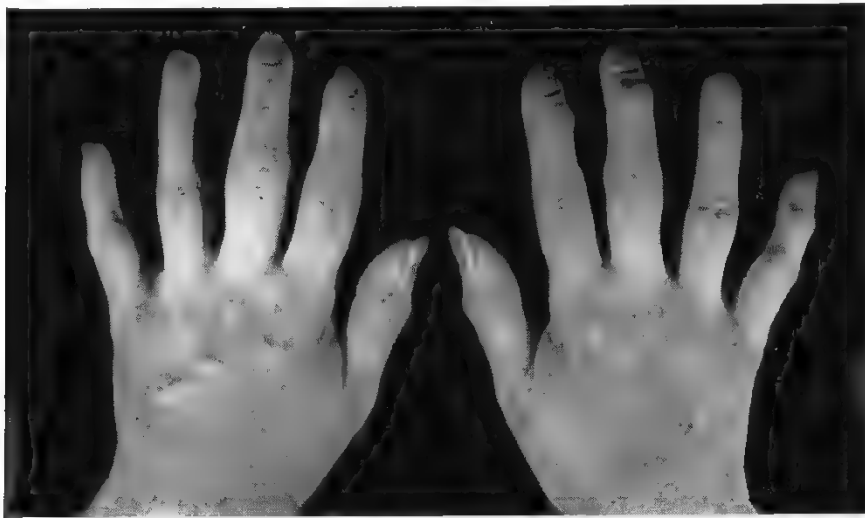
**Heberden's Nodes** were described by him as 'Little hard knobs, about the size of a small pea, which are frequently seen upon the fingers, particularly a little below the top near the joint'. He also stated that they were not due to gout. The nodes are unsightly rather than inconvenient, and seldom attended by pain. The *terminal* interphalangeal joint of any or all the digits, except the thumbs, usually is involved, the enlargement being sufficient to be seen (*Fig. 848*) and felt as a definite bony ridge across the palmar and dorsal surface of the affected joints. Most cases occur in women about the time of the menopause and do not necessarily herald osteoarthritis of other joints, as is commonly believed (Stecher). In males the lesion is nearly always solitary and is the result of bygone trauma, particularly a cricket or baseball injury to the finger, which was of sufficient violence to be remembered by the recipient many years later.

Heberden's nodes are due to osteoarthritis: they are to be distinguished from the less common spindle-shaped fingers due to swelling of the *proximal* interphalangeal joints which is one of the manifestations of rheumatoid arthritis.

**Rheumatoid Arthritis involving the Hand.**—Advances in hand surgery have made it possible to remedy the common deformities caused by rheumatoid

WILLIAM HEBERDEN, 1710–1801, *Physician, who practised in Cambridge and later in London. He was physician to George III and to the illustrious writer Dr. Samuel Johnson.*  
ROBERT M. STECHER, 1896–1972, *Physician, Metropolitan Hospital, Cleveland, Ohio.*

PHYSICAL SIGNS IN CLINICAL SURGERY  
ARTHRITIS OF THE HAND



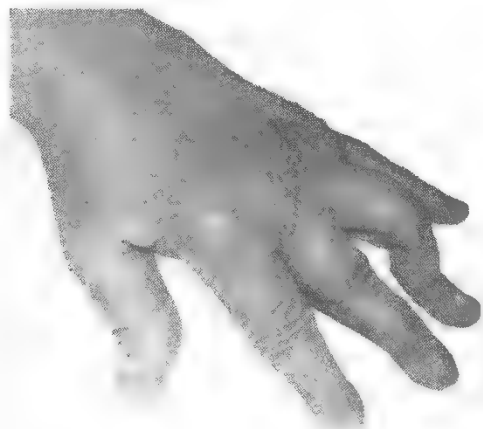
*Fig. 848.*—Heberden's nodes. The distal interphalangeal joints are affected in three-quarters of cases and the proximal in a quarter of cases. The fingers affected are the index, middle, little, and ring fingers in that order of frequency.



*Fig. 849.*—Pannus in rheumatoid arthritis, most marked over the metacarpophalangeal joints.



*Fig. 850.*—Ulnar deviation.



*Fig. 851.*—'Swan-neck' contracture of the middle finger and button-hole deformity of the ring finger in rheumatoid arthritis.

ritis in selected circumstances. It is therefore necessary for the surgeon to recognize certain conditions due to the disease.

In the first stage hypertrophy of the synovial membrane of joints (*pannus*)\* occurs. The most commonly affected are the metacarpophalangeal joints (*Fig. 849*) (index finger most frequently and severely); the proximal interphalangeal joints are next most often involved, and thirdly, pannus is seen on the dorsum of the wrists. During this stage synovial thickening may also cause trigger finger (*see p. 493*), or the carpal tunnel syndrome (*see p. 473*).

The second stage is characterized by ulnar deviation of the fingers, the angulation occurring at the metacarpophalangeal joints (*Fig. 850*).

Lastly, deformities occur due to dislocations and attrition rupture of tendons. Thus there may be dislocation of a metacarpophalangeal joint or joints. Another typical deformity is 'swan-neck' contracture of a finger (due to hyperextension of the proximal interphalangeal joint and flexion of the distal interphalangeal joint) (*Fig. 851*), the result of fibrosis of the small muscles of the hand. The button-hole deformity is also seen (*Fig. 851*). The commonest tendons to undergo attrition rupture are the long extensors of the fingers and thumb (*see p. 493*).



*Fig. 852.*—Tuberculous dactylitis



*Fig. 853.*—Enchondroma present in a woman of 75 and growing slowly since adolescence.

**Dactylitis.**†—When the phalanges or the metacarpals are inflamed the condition is known as dactylitis. The bone becomes enlarged, spindle-shaped and, in the case of *tuberculous dactylitis* (*Fig. 852*), painful. Within a matter of weeks the skin over the affected bone appears smooth and shiny, then, unless the progress of the disease is checked, red and tender, and frequently an abscess forms. Not uncommonly more than one bone of the hand is attacked. In *syphilitic dactylitis* (now rare) a similar *painless* swelling occurs which may also break down. In the tropics *sickle-cell anaemia* (*see p. 331*) causes dactylitis due to infarction of bone resultant on thrombosis of the nutrient artery.

Dactylitis must be distinguished from an **enchondroma**, an example of which is shown in *Fig. 853*.

**Sprain of an Interphalangeal Joint** also gives rise to spindle-shaped swelling of a digit which is wont to persist for months, and in severe cases is sometimes permanent.

\* Latin, *pannus* = cloth.

† *Dactylitis*. Greek, δάκτυλος = a finger; inflammation of a finger or toe.



**Suspected Fracture of a Phalanx or a Metacarpal Bone.**—All the bones of the fingers and thumb are practically subcutaneous so that when one is fractured completely with displacement (or a dislocation of an interphalangeal joint has occurred), the deformity produced is often obvious. When swelling obscures the displacement, or the bone is incompletely broken, the clinician should run his finger along the dorsum of the relevant phalanx or metacarpal, noting any tenderness or deformity. In the case of a spiral fracture of a metacarpal bone with shortening, *loss of prominence of the relevant knuckle* is a sign of value.

**Bennett's Fracture** is an oblique fracture through the articular surface of the first metacarpal which allows subluxation of the joint. It occurs predominantly



*Fig. 854.*—Bennett's fracture (*right*). The patient cannot approximate the tip of the thumb to the tip of the ring finger. Note the haematoma of the thenar eminence.

through indirect violence—falls or blows against the thumb extended in a parrying gesture, or knocks that strike the distal part of the metacarpal, especially when the hand is clenched, so that it is common in boxers. Directly after the accident restricted movement is evident: not seldom, the thumb is forced into a semiflexed position. Despite every attempt the patient cannot approximate the tips of the thumb and ring finger (*Fig. 854*), let alone the tips of the thumb and the little finger (*Gedda*) nor can he clench his fist. Soon a large haematoma of the thenar eminence becomes apparent (*Fig. 854*) and the subluxation becomes palpable.

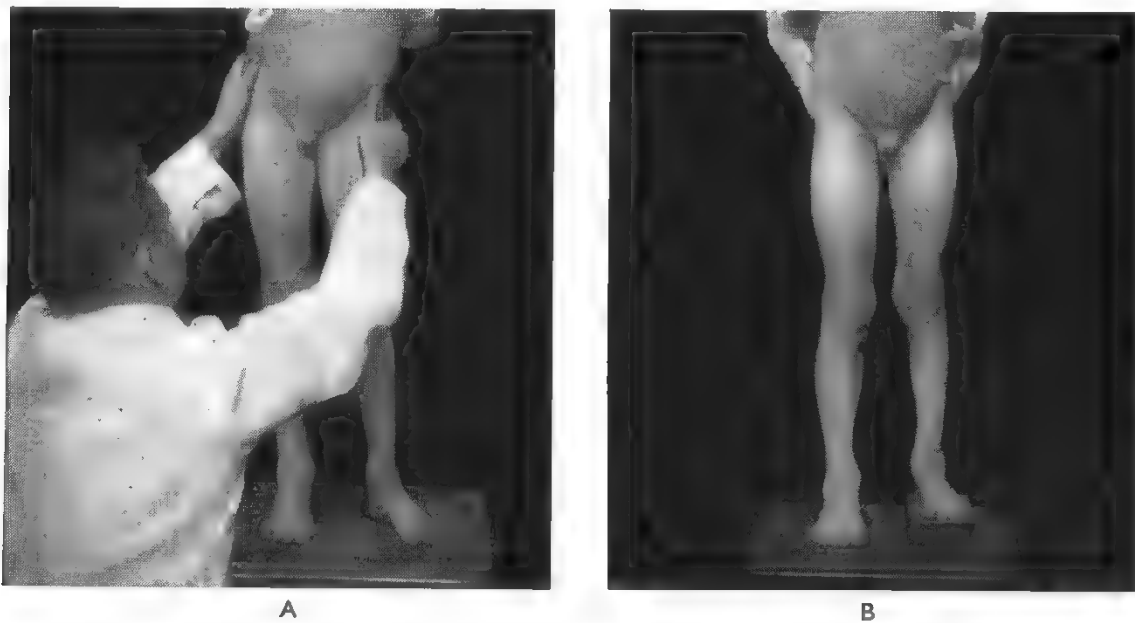
## CHAPTER XXXIII

## THE HIP-JOINT AND THE THIGH

**Gait.**—See p. 449.

**Preparation of the Patient for the Examination.**—For a child all clothing is removed. For a man, all clothing must be discarded, except for a shirt. In the case of a female, a nurse sees that the necessary clothing is taken off, and the patient is provided with a pair of bathing triangles to wear during the examination.

**Examination Standing.**—If the patient is ambulatory, inspection is started in the standing posture, first with the patient facing and then with his back towards the clinician.



**Fig. 855.**—**A**, Ascertaining if shortening is present. **B**, Measuring the amount of shortening by insinuating blocks beneath the short limb to such a height as to render the pelvis absolutely level. If the trochanters are then level the shortening is below them, if not it is in the head or neck of the femur.

**Stance.**—A patient with arthritis of the hip-joint tends to bear most of his weight on the sound leg to lessen weight-bearing. This, in many instances, results in slight flexion of the knee-joint on the affected side (*see Fig. 757*, p. 446).

**Asymmetry.**—As seen from the front, the group of muscles most to suffer from disuse atrophy is the adductors. At this juncture ask the patient to turn round for a moment. Flattening of the buttock, due to wasting of the glutei, is often evident with chronic arthritis of the hip-joint of some standing.

*The presence of scars or sinuses in the immediate neighbourhood is most significant (see Fig. 856).*

**The Pointing Test.**—Usually pain is experienced in the groin. Less frequently it is felt deeply in the buttock, posterior to the greater trochanter as an increase in tension in the hip-joint causes pain and spasm in those muscles with the same nerve-

supply. Not infrequently pain passes from the hip to the knee. Remember, however, that in some instances the pain is felt *solely in the knee*, although the arthritis is limited to the hip-joint of the same side. Branches of the femoral, the sciatic, and the obturator nerves all give twigs to both joints. The geniculate branch of the obturator is the main conveyor of pain referred from the hip- to the knee-joint.

*Is there any Tilting of the Pelvis?*—Concentrate on the anterior superior iliac spines, with a view to ascertaining if they lie on the same horizontal plane. A tilted pelvis usually is the result either of the lower limb being held in an adducted position, or of shortening of one leg, or of surgical arthrodesis in abduction.

*If Tilting is present, is the Tilt due to Apparent or to Real Shortening of the Limb?*—Apparent shortening is due to fixed adduction deformity. Real shortening means that the limb is really short. Both can coexist.

It is of overriding importance to settle at this stage the fundamental question—is tilting due to real shortening of the affected limb? If so, is that shortening situated above the level of the greater trochanter? Kneel facing the patient, and place the thumbs on the anterior superior iliac spines and the ring and little fingers behind the greater trochanters, while the middle finger of each hand gropes for, and finds, the tip of each greater trochanter. Slight differences in the height of the trochanters are detected easily in this rapid way (*Fig. 855 A*). If the tip of one greater trochanter lies nearer the anterior superior iliac spine than the other, ascertain how much shortening of the limb has resulted:—

Build blocks (or books) under the short limb to such a height as to make the pelvis absolutely level (*Fig. 855 B*). By measuring the height of the support the amount of real shortening is ascertained with an accuracy unobtainable by any other method (Todd). If the patient is ambulatory, undoubtedly this is the method that should be employed.



*Fig. 856.*—Hugh Owen Thomas's sign. Note the result of flexing the normal hip-joint of the opposite side. Case of fibrous ankylosis due to tuberculosis. Note the scars of bygone sinuses.

When the patient is confined to bed, or is too young to co-operate in the rectification of the pelvic tilt just described, careful measurements of the length of each lower limb must be undertaken (*see* p. 505).

**Apparent Shortening.**—If real shortening cannot be demonstrated by these methods it becomes obvious that the shortening *must* be apparent.

**Examination of the Patient Lying Supine.**—After having made certain that the patient is lying without a lateral tilt of the pelvis, seek Thomas's sign, the significance of which must be understood.

**Hugh Owen Thomas's Sign.**—Fixed flexion deformity of the hip-joint can be masked by increased normal lordosis. As you look at the patient lying in *Fig. 856 A*, you may be deceived, for the whole limb lies flat upon the couch. This sign unmasks a possibility that the clinician is being beguiled by the patient's posture and reveals the true position of the affected limb.

Pass the hand (palm upwards) beneath the lumbar spine, and with the other hand flex the *sound* hip until the lumbar vertebrae can be felt hard against the hand. This means that all the lordosis has been corrected. Observe the affected limb. If flexion deformity is present, estimate and record the angle (*Fig. 850 B*).

**Testing the Movements of the Hip-joint.**—Make sure that the pelvis is square with the couch and that it does not move as you proceed as follows:—



*Fig. 857.*—Rotation. *Method A:* 'Rocking' the hip-joint. In this case rotation appeared curtailed on the affected (left) side, and the test is being elicited on the non-affected side. Always compare any restricted joint movement with that of the sound side.

1. **Rotation.**—Lay the flat of the hand upon the thigh, and rock the limb to and fro observing the patella or the foot (*Fig. 857*) as an index of the degree of rotation. Performed in this way, this is a delicate test which can be carried out with the utmost gentleness. If it causes pain (e.g., in acute arthritis), the subsequent programme for testing various movements must be curtailed or modified.

Rotation can also be carried out by flexing both the hip- and the knee-joints to a right-angle, and using the foot to lever the limb round (*Fig. 858*). Common sense dictates that this violent method be employed only in appropriate cases. Its zenith of usefulness is in the early diagnosis of a slipped epiphysis, where limitation of internal rotation is the leading, if not the only, physical sign (*see* p. 511).

2. *Abduction*.—Flex the hips to a right-angle and ask the patient to place the soles of the feet together and then to carry the knees outwards as far as they will go (*Fig. 859*). Measure the angle of abduction on both sides. In infants abduction



*Fig. 858.*—Rotation. *Method B.*



*Fig. 859.*—The abduction possible in a young child with normal hip-joints.



*Fig. 860.*—Adduction. Normally the middle third of the thigh can be crossed.

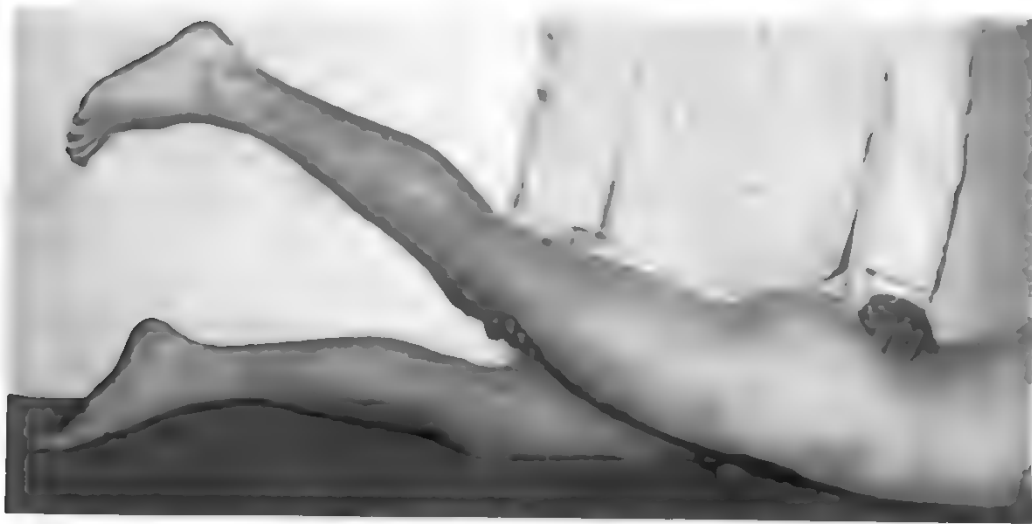


to  $80^{\circ}$  is possible but this angle is gradually reduced with advancing age to reach  $60^{\circ}$  in normal hips in old age. Comparison of the normal (painless) side with the side on which the patient complains of pain is often important.

3. *Adduction.* Steady the pelvis, and carry the thigh over its fellow. Normally it should cross the middle third (*Fig. 860*). Record in terms of the opposite thigh—i.e., whether the lower, middle, or upper third of the opposite side can be crossed.



*Fig. 861.*—Flexion.



*Fig. 862.*—Testing extension of the hip-joint.

4. *Flexion.*—Flex the knee on the *affected side* (cf. Thomas's sign, p. 501), and then flex the hip as far as possible, proceeding cautiously (*Fig. 861*).

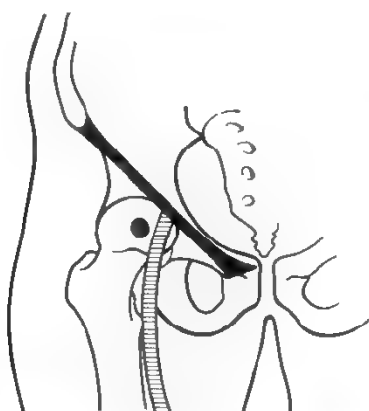
Up to the present, the examination has been carried out with the patient on his back. Ask him to turn over on to his abdomen, and test:—

5. *Extension.* Steady the pelvis. Place the hand behind the knee and lift the limb (*Fig. 862*). Normal extension is only  $10^{\circ}$ . It is limited early in all forms of arthritis.

**Telescopic Movement.**—The pelvis is fixed, the thigh is grasped above the knee, and the hip-joint is flexed to  $90^{\circ}$ . The thigh is pushed, and then pulled. In congenital dislocation of the hip

in a young child the characteristic sensation, which can be likened to that of pulling out a telescope, sometimes can be elicited. Convincing proof of this is afforded if the greater trochanter and the head of the femur can be felt to move up and down in the buttock. The sign is also well marked in cases of Charcot's disease (*see* p. 448).

**Direct Palpation of the Hip-joint and seeking Joint Crepitus.**—Lying in its socket, and heavily clothed with muscle, the greater part of the joint is quite inaccessible. The capsule, however, is prolonged down the neck of the femur, and it is here that signs of disease are sought. Place a finger on the anterior superior iliac spine and follow the lower edge of the inguinal ligament medially until the pulsation of the femoral artery can be felt. Just below the inguinal ligament and



*Fig. 863.*—The black dot represents the spot where tenderness of the hip-joint is sought. The thick broken line is that of the femoral artery.



*Fig. 864.*—Mensuration for wasting. Both thighs and both calves are measured at exactly corresponding points.

just lateral to the femoral artery the pulp of the finger will lie directly over that small portion of the head of the bone that is not intra-acetabular (*Fig. 863*). Exert increasing pressure—tenderness suggests arthritis. With the other hand, rotate the hip-joint by rocking (*see Fig. 857*)—the head of the bone will be felt to move; joint crepitus may be transmitted to the finger. Absence of the head of the femur signifies that it is dislocated (*see* p. 505). To confirm the presence of crepitus, place the bell of the stethoscope where the finger rested and again rotate the thigh by rocking while listening.

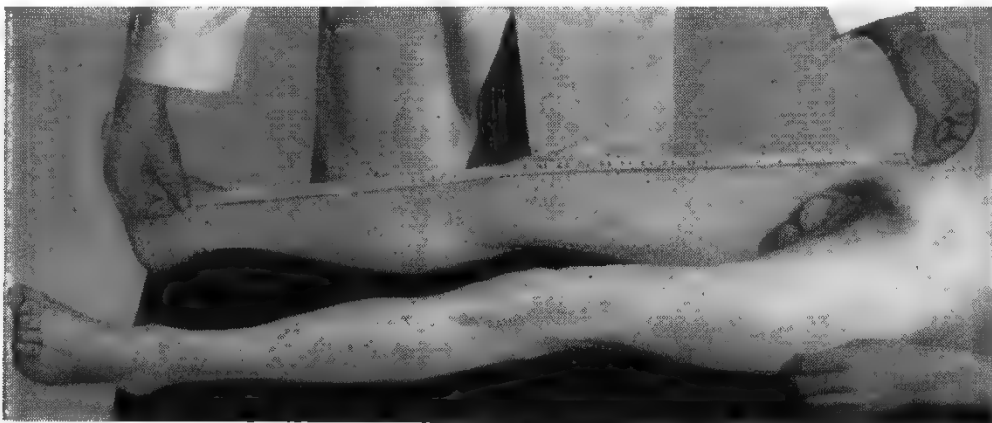
**Mensuration.—**

*Girth.*—Minor degrees of wasting can be revealed by measuring and comparing the girth of the thigh and leg on each side.

*a.* From the anterior superior iliac spine, measure off a convenient distance down the thigh. Mark this point. Measure off the same distance on the other thigh, and mark it. At the points marked, measure the girth of the thighs (*Fig. 864*).

*b.* From the tibial tuberosity mark off identical points down each leg, and measure the girth of the calves.

*Length.*—The normal limb must be placed in an exactly similar position to the affected limb before the measurements are taken, i.e., if there is an adduction deformity, the normal limb must be adducted a similar amount. Find the tip of the medial malleolus on each side, and mark the point. Define the anterior superior spine on both sides; an error in measurement frequently occurs because an identical point on the spine is not chosen on each side. With one finger palpate the inguinal ligament, and follow this up until the first bony point is reached. If this is done on each side and the first bony part is marked, error from this cause is avoided. Measure the distance (from the anterior superior iliac spine to the tip of the medial malleolus) on each side (*Fig. 865*). Record the measurement of each limb. This is *real* length, not apparent length which is of no importance.



*Fig. 865.*—Measuring the length of the limb. The distance between the anterior superior iliac spine and the tip of the medial malleolus is measured on each side. The tape-measure should lie evenly along the inner border of the patella.

In many instances the examination of the hip-joint is complete only when the other major joints, especially the knee-joints, have been tested for gross abnormalities.

**SIGNS IN INDIVIDUAL DISEASES OF THE HIP-JOINT**

The principal affections of the hip-joint encountered at various ages are congenital dislocation (from birth onwards); osteochondritis juvenilis (3–8 years); slipped epiphysis of the head of the femur (10–15 years); osteoarthritis due to previous disorder of the joint (20–40 years); osteoarthritis without such a precursor (over 40 years of age). As a rule, tuberculosis of the hip-joint commences in early childhood, but there are a number of exceptions.

**Congenital Dislocation of the Hip** is relatively common, occurring four times more frequently in girls; if the 1 in 4 bilateral cases alone are considered, the

female incidence is higher still. There are also racial differences: it is especially common in a belt extending across Southern France, Northern Italy, Austria, Czechoslovakia, and Poland, and also in Japan, and particularly rare in Negro races who habitually carry their babies on their backs with the babies' hips abducted. The earlier the condition can be diagnosed, the less difficult is it to remedy, and it is now widely recognized that it should be diagnosed at, or soon after, birth.

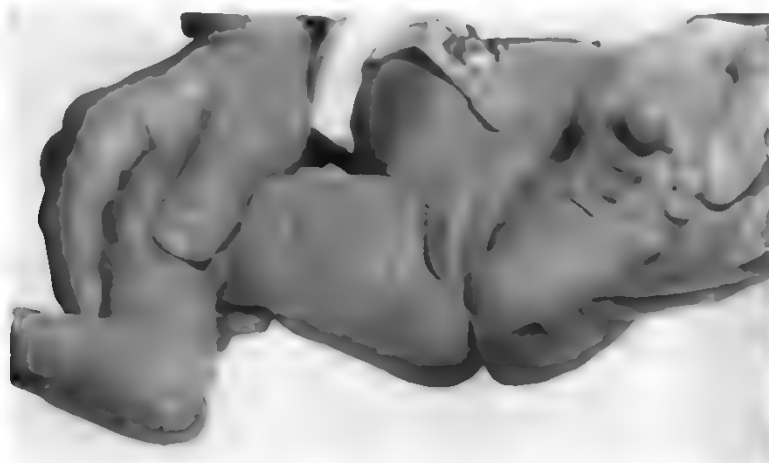


Fig. 866.—Limited abduction of the left hip in congenital dislocation.

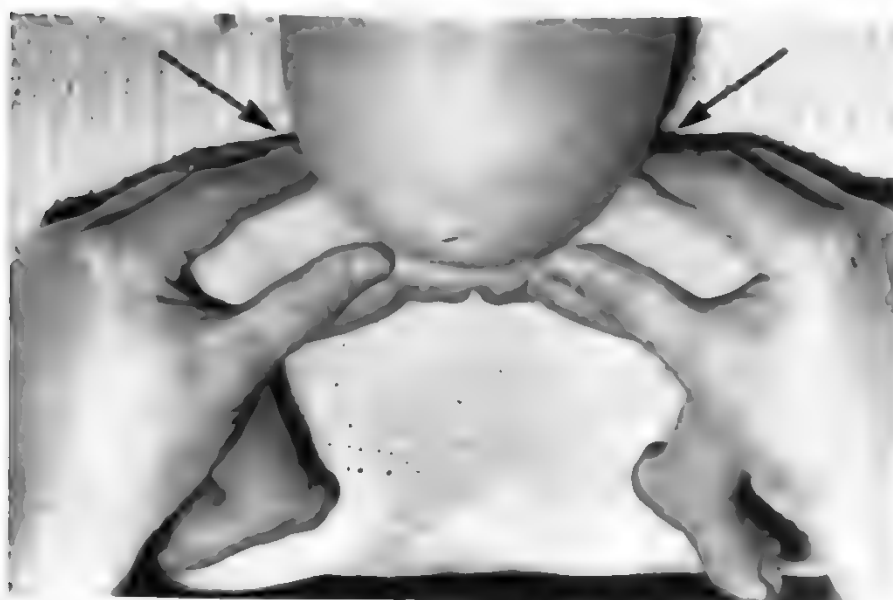


Fig. 867.—Method of eliciting Ortolani's 'sign of the jerk'. The arrows indicate the direction of pressure by the fingers over the greater trochanters. The best of all tests for the very early diagnosis of congenital dislocation of the hip-joint.

**SIGNS IN THE NEONATE AND THE INFANT.**—Before weight-bearing commences, the head of the femur usually is subluxated, but not dislocated. The physical signs during the first six months of life (before the child commences to crawl) are as follows:

*Limited Abduction* of a hip or hips (Fig. 866) indicates that actual dislocation is present.

*Barlow's Modification of Ortolani's Test.*\*—The infant is laid on a firm flat surface such as a table. The knees and hips are flexed and semi-abducted. The examiner's fingers over the greater trochanters (*Fig. 867*) push the trochanters forward and medially while the thumbs just below the inguinal ligaments feel for the heads of the femurs which, if subluxated, will slip into the acetabulum on the affected side, or sides, with a palpable jerk. Release of pressure by the fingers leads to another jerk as the subluxation recurs.

*Telescopic Movement* (*see p. 503*) often can be obtained.

**Other Clinical Findings in Early Life** are of academic interest only. Very broad buttocks and undue *widening of the perineum* in bilateral cases, and *extra skin creases* along the adductor aspect of the thigh in unilateral cases (*Fig. 868*) are especially noticeable. Occasionally an observant mother will bring the child because she has noticed that when changing napkins one knee does not spread as far as the other.

*Delayed Walking.*—Although it should now seldom present in this way, unless there is another good reason, any child who is not walking by 18 months should be suspected of having a congenital dislocation of the hip.

**SIGNS IN CHILDHOOD AND IN ADOLESCENT LIFE.**—After the patient has learned to walk the diagnosis should not present any difficulty if attention is directed to the following points:—

*The Female Contour of the Pelvis.*—The normal child (male or female) has a male pelvic contour. The child with a unilateral or bilateral dislocated hip has a distinct female pelvis contour (*Fig. 869*). In addition, the buttocks and the abdomen are prominent.

*The Trendelenburg Gait.*—The hip on the affected side lurches up when weight is borne on it. Watch the shoulder, rather than the buttocks (Perkins). The shoulder dips down on the affected side every time weight is borne on that side. In bilateral cases first one, and then the other, shoulder dips.

*Shortening* of the affected limb from the pelvis to the knee is observed by flexion of the knees and the hips as shown in *Fig. 870*.

*Trendelenburg's Sign.*—Normally, each leg bears half the body-weight. When one leg is lifted, as in normal walking, the other takes the entire weight. As a result the trunk has to incline towards the weight-bearing leg, and the pelvis tilts, rising on the side not taking the weight. When this mechanism fails the sign is positive.

The patient stands on the unaffected lower limb first; the buttock on the affected side rises as the pelvis tilts to take the body-weight. Next she stands on the affected side; if it is the seat of a congenital dislocation of the hip-joint, the *pelvis on the opposite (normal) side sinks*, as shown by the level of the iliac crests and the gluteal folds. The reason for this is that the head of the femur is out of its socket and the iliotrochanteric muscles are not powerful enough to maintain the horizontal

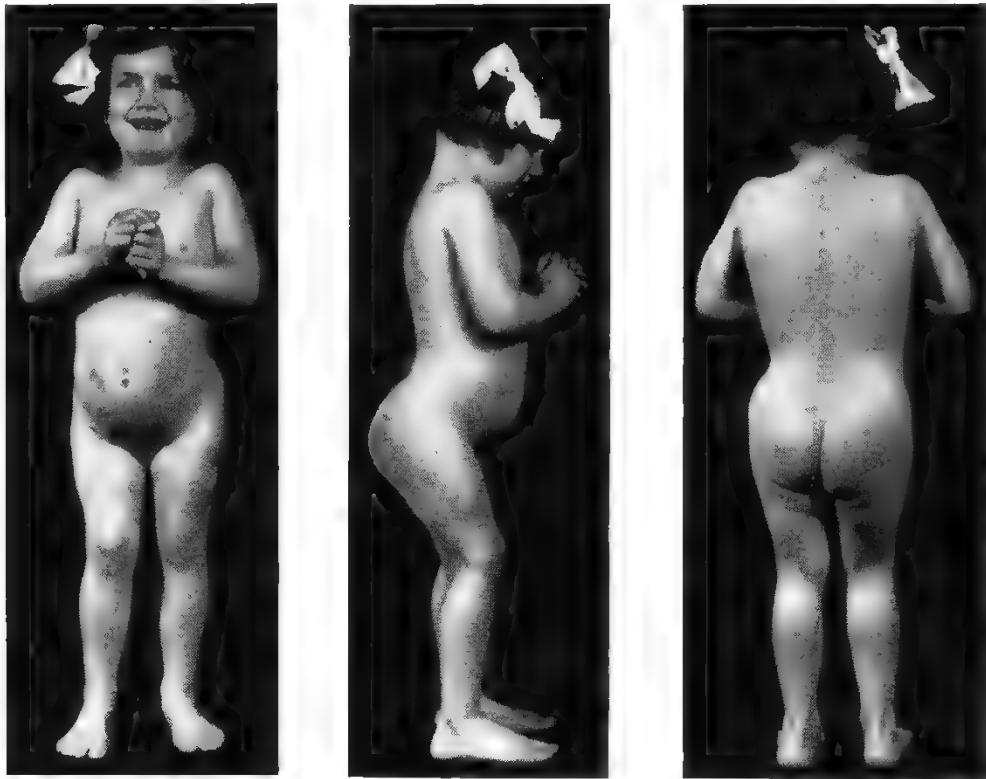


*Fig. 868.*—Additional skin crease on the inner side of the thigh of a patient with congenital dislocation of the left hip-joint.

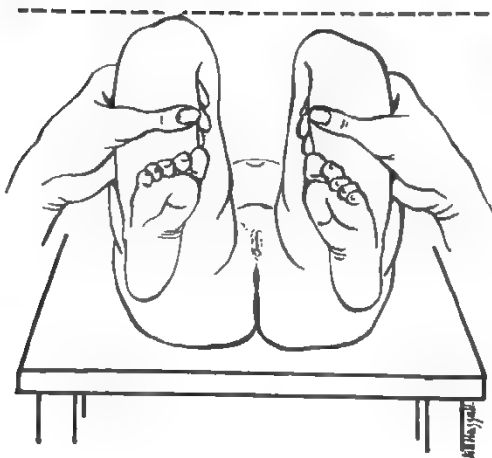
\* As with so many tests and diseases in medicine and surgery this was described long before it was generally recognized: in this instance by Pierre le Darnoy (1870–1963), an orthopaedic surgeon of Rennes, France, in 1912.



position of the pelvis (*Fig. 871*). Valuable as it is in confirming the diagnosis of unilateral congenital dislocation, the test is not pathognomonic. It indicates nothing more than a defect in the osseo-muscular mechanism between the pelvis



*Fig. 869.*—Bilateral congenital dislocation of the hip.



*Fig. 870.*—Demonstrating shortening due to unilateral congenital dislocation of the hip of a young child (Allis's sign). The examination must be conducted on a bare table.

and the femur. It is also present in poliomyelitis when the glutei are affected, in un-united fracture of the femoral neck, in pathological dislocation, and in coxa vara.\*

**CONGENITAL DISLOCATION OF THE HIP IN ADULT LIFE.**—To those signs to which the reader's attention has been directed, two more are added: (1) Pain; (2) Joint

\* *Coxa vara*. Latin, *coxa* = hip-joint + *varus* = bent inward. The angle between the neck and shaft of the femur is decreased, due to a congenital defect, softening of the bone, slipped epiphysis, or malunited fracture.

crepitus, because the patient develops osteoarthritis in the head of this bone and in the apology for a socket that Nature attempts to provide on the dorsum ilii.

**Pathological Dislocation of the Hip-joint** is a complication not only of infected destructive lesions of the hip-joint, but also of spastic paralysis, poliomyelitis, and spina bifida. The signs are those of the causative condition to which are added those of congenital dislocation.

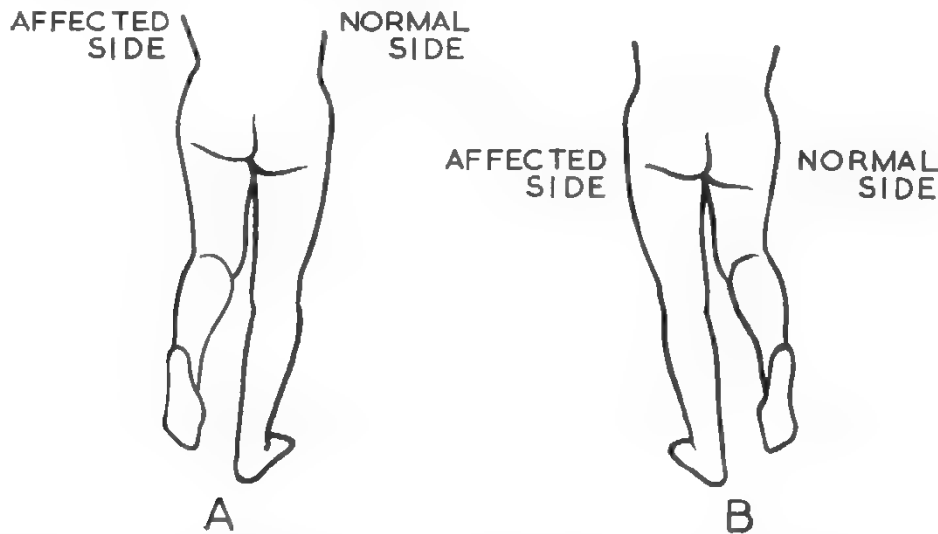


Fig. 871.—Trendelenburg's sign. A, The patient stands on the unaffected leg. The buttock on the opposite side rises. B, The patient stands on the affected leg. The buttock on the other side sinks.

**Acute Suppurative Arthritis** of the hip-joint is least uncommon in babies, and is nearly always secondary to a more general infection. The diagnosis should be considered in any child who has pyrexia and develops a limp, or refuses to walk. A child of 3 years of age or more is able to locate the site of the pain; otherwise entire reliance must be placed on careful clinical examination. As a result of the effusion, the hip-joint takes up a position of flexion, abduction, and external rotation—the position of greatest fluid capacity—and in a baby this is so characteristic as to be designated the 'frog position' (Fig. 872). Gentle pressure over the capsule of the joint (*see Fig. 863*) causes the child to scream. To confirm the diagnosis, needle aspiration of the hip-joint under anaesthesia must be undertaken.

**Traumatic (Transient) Synovitis** of the hip-joint is impossible to distinguish from the very earliest stages of the following three conditions which may affect the hip-joint in childhood; special investigations (X-ray, sedimentation rate) and a period of observation are necessary. The child presents with pain, a limp, and a



Fig. 872.—Acute suppurative arthritis of the right hip-joint, showing the 'frog position'.

hip in the position of greatest ease (*see Fig. 757, p. 446*), but without the toxæmia or high pyrexia of acute suppurative arthritis. Minor trauma is the presumed cause and the effusion absorbs after a few days' bed-rest, leaving an absolutely normal range of movement.

**Tuberculous Arthritis.**—The hip-joint is second only to the vertebral column as the most frequent site of tuberculosis of bones and joints. It has become uncommon except in those primitive communities with poor resistance.

*A Limp* is the first, and a constant, sign. To commence with, the limp comes on after the patient has walked some distance and is tired; later it is in evidence after resting (e.g., in the early morning) as well.

*Pain*, more often referred to the thigh or to the knee than experienced locally, is also an early symptom.

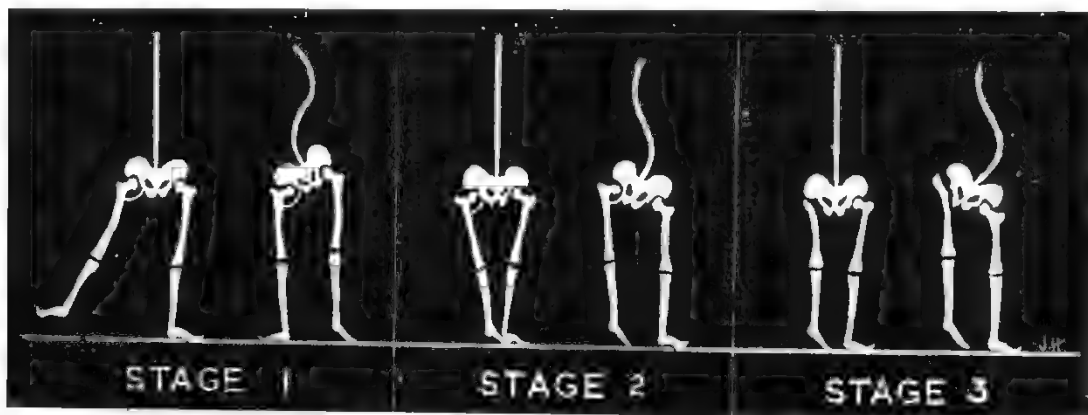
*Night Cry.*—Starting pain at night is very important, as it attracts more attention than occasional discomfort during the day (Whitman). Relaxation of protective contraction of muscles allows the inflamed joint surfaces to come in contact with one another and causes the child to utter a sharp cry, usually early in the night. Often he will be found holding the thigh with the hands.

*Muscular Wasting.*—At first revealed only by careful measurement, muscular wasting of the thigh does not linger far behind the above signs—later such wasting, particularly of the buttock, is apparent to the naked eye.

*Hugh Owen Thomas's Sign* (*see p. 501*) becomes positive at a very early stage, and reveals that the limb is held in concealed flexion. Limitation of extension is also a valuable early sign.

*General Signs.*—Malaise and pallor accompany tuberculous arthritis. The temperature in the early stages is of little diagnostic value.

As the disease progresses (now unusual with adequate treatment) the affected limb passes through three classic successive phases (*Fig. 873*).



*Fig. 873.*—The three stages through which untreated tuberculosis of the hip passes.

*Stage 1.*—The limb is held in slight flexion, slight abduction, and lateral rotation (the position of greatest fluid capacity of the joint, which is the seat of effusion). In order to bring the legs parallel the patient *tilts down* the pelvis on the affected side; to permit this, the lumbar spine becomes curved, the convexity being towards the affected side—the stage of *apparent lengthening*.

*Stage 2.*—As the effusion subsides and spasm of the powerful adductors increases, the position changes to one of flexion, adduction, and medial rotation. *Tilting upwards* of the pelvis on the affected side causes *apparent shortening*.

*Stage 3.*—As the head of the bone becomes eroded, *real shortening* supervenes, and increases as dislocation of the head of the bone develops and is supplemented by retardation of growth from the disturbance of the epiphysis.

*An Abscess or Abscesses.*—The longer the disease remains active the greater the liability to cold abscess formation.

**Osteochondritis Juvenilis** (Legg-Calvé-Perthes Disease).—The blood-supply of the head of the femur becomes defective, and this part of the bone undergoes very slow, quiet, aseptic necrosis. As a result, the head of the femur collapses and becomes mushroomed. The cause is speculative.

Boys are affected four times more often than girls. The patient remains in good general health and is quite afebrile (most important facts in differential diagnosis). The most constant early sign is a comparatively painless limp. In the early stages all movements of the hip-joint are slightly restricted as there is a traumatic synovitis. Later abduction is found to be considerably diminished, and so is internal rotation. As a rule, other movements are full and painless. Muscular wasting of the limb occurs, and moderate flexion and adduction deformity is liable to cause prominence of the greater trochanter. In established cases (after 2 years from the onset of symptoms) a small amount of real shortening is present. Radiography is necessary to confirm the diagnosis, but except in the very early stages a confident clinical diagnosis is possible.

In bilateral cases (10 per cent) the patient develops a characteristic waddling gait, reminiscent of congenital dislocation of the hip. Trendelenburg's sign (*see* p. 507), however, is negative.

**Slipped Epiphysis of the Head of the Femur.**—This is a fairly common cause of limp and pain in the hip during adolescence. It is more common in boys than in girls by a ratio of 4:1. Usually, but not always, the child is either obese from hypogonadism (*see* p. 48), or else is tall for his age, thin, and growing rapidly. There may be a history of trauma, but usually it was mild. The typical onset is so insidious that the condition is often ignored by the parents and over-looked by the doctor until the deformity is obvious. The earliest symptom is a painful limp with, often, the pain referred to the knee. At this stage ordinary radiographs may be normal. Physical examination very frequently establishes the diagnosis. The cardinal sign is definite painful limitation of abduction and internal rotation of the hip-joint. On examination standing the greater trochanter on the affected side feels higher and more posterior than on the normal side. Should the patient continue to bear weight on the affected leg he acquires more limp, more pain, shortening, and external rotation of the femur due to forward and upward displacement of the neck of the femur on its head so that Trendelenburg's sign becomes positive.

**Osteoarthritis** is easily the commonest disorder of the hip-joint arising in adult life. The triad of pain, stiffness, and deformity is found ultimately, irrespective of whether the arthritis is primary or secondary.

*Pain* usually is the presenting symptom. It is of a boring character and is mainly localized to the joint concerned, although it may be referred, i.e., to the knee or to the back; shooting pain causing the leg to 'give way' is a variant.

*Stiffness*, especially after rest, is common. Rising from a chair is difficult, and the patient says it takes him a minute or two to 'get going'. Increasing difficulty

in tying the shoelace on the affected side is an important early sign. Stretching the legs apart becomes noticeably restricted early.

*Limp.*—Even in the earliest stages the patient limps, and often this is noticed by friends and not by the patient. The cause is either pain or apparent shortening due to adductor spasm. The limp is increased by weak muscle groups, particularly the glutei of the affected side which may be so weak as to show a positive Trendelenburg's sign.



Fig. 874.—Male, aged 55 years, with osteoarthritis of right hip-joint. Hip becomes stiff after sitting. Some difficulty in putting on his right shoe. Walks with a stick, and for no farther than half a mile without pain. Five years' history.

*Restricted Walking.*—More and more, walking is restricted, because it induces pain which is inclined to have the characteristics of intermittent claudication, in that the patient must halt to rest at intervals, but the pain is not mainly in the calf or calves. The foot pulses (*see p. 389*) should be palpated carefully.

*Stance.*—The commonest result is adduction of the thigh, eversion of the foot, and flexion of the hip-joint. As the adduction deformity increases, in order to maintain balance the pelvis is tilted upwards on the affected side (*Fig. 874*). This causes scoliosis, which at first is temporary, when standing or walking. Occasionally adduction is so extreme as to cause a scissors gait. In bilateral cases, in spite of the adduction, scoliosis and pelvic tilt are absent.

*Routine Examination of the Hip-joint* shows some restriction of all movements, but internal rotation, abduction, and extension are restricted early. Apparent shortening amounts to 2.5–5 cm.; real shortening is never great, and occurs (from loss of cartilage and flattening of the head of the femur) only when the disease is fairly advanced.

*Swelling of the Joint.*—As a result of synovial thickening and serous effusion, the joint is swollen. Careful palpation of the joint (*see Fig. 863*) sometimes permits this to be made out when compared with the opposite side.

*Joint Crepitus.*—The irregular joint surfaces, with or without loose bodies, give rise to coarse grating, which is palpable and audible with a stethoscope.

*Examine Other Joints.*—In no other joint condition is this injunction more important. To examine the contralateral hip, knees, and the spine is fundamental.

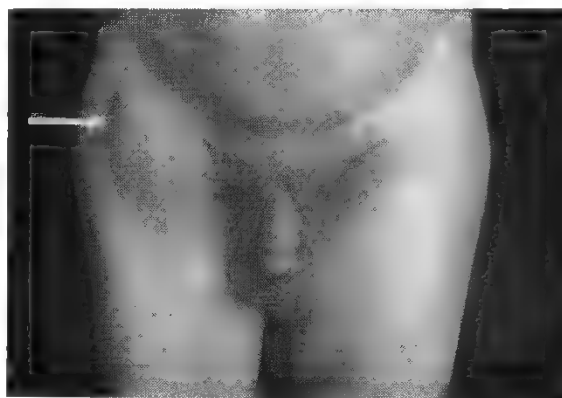
*Psoas Bursa.*—Distension of a psoas bursa is a clinical entity that causes diagnostic difficulty. This is understandable, for it is rare and has to be distinguished from several other swellings that occupy much the same position. Beneath the inguinal ligament there is a tense swelling (*Fig. 875*) situated in the femoral triangle. Fluctuation is often doubtful because the swelling is so tense and its capsule is so thick. The swelling is too far lateral to be associated with the femoral canal, which excludes an irreducible femoral hernia.

The clinician who immediately suspects a psoas abscess is to be congratulated, but on deep palpation in the iliac fossa, he fails to find an extension of the swelling so characteristic of an abscess. As a rule a psoas bursa is accompanied by flexion, abduction, and lateral rotation of the limb, an attitude that relieves tension. The diagnosis is often clinched by discovering evidences of



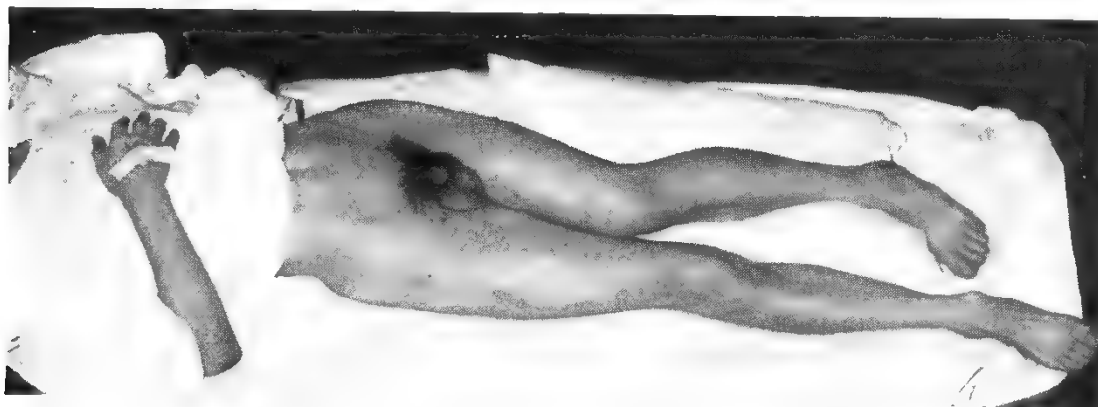
osteoarthrosis in the corresponding hip-joint, for the bursa frequently, but not necessarily, communicates with that joint.

*Fig. 875.*—Psoas bursa. The patient, aged 65, complained of great pain in the groin and difficulty in walking. The latter was due to advanced osteoarthrosis of the hip.



**Fibrous or Bony Ankylosis of the Hip-joint?**—In cases of fibrous ankylosis the patient suffers pain; in bony ankylosis this is absent. Considerable difficulty is experienced in differentiating extensive fibrous ankylosis from bony ankylosis. In the latter there is absolutely no movement at the hip-joint; in the former movement may be so slight as to defy detection by routine examination. The best method of detecting very slight movement at this joint is to place one hand over the anterior superior iliac spine and the greater trochanter, and to rock the thigh from adduction to abduction with the other.

**Traumatic Dislocation of the Hip-joint.**—One of the results of the increase in traffic accidents is that *posterior dislocation of the hip-joint* is no longer rare (Gissane). The victim's knee hits the dashboard, and the force transmitted up the femur drives



*Fig. 876.*—Traumatic posterior dislocation of the hip-joint.

the head of the bone out of its socket. The result of this form of violence is that not only is the head of the femur dislocated but, often, the rim of the acetabulum is fractured as well. The patient experiences severe, unremitting pain in the groin and the thigh. The limb lies in a position of adduction, medial rotation, and slight flexion (*Fig. 876*): active movement is confined to the foot. The greater trochanter is unduly prominent. The palpating finger over the site of the hip-joint (*see Fig. 863*), instead of meeting the usual resistance, sinks in. It may be possible to feel the head of the femur riding the dorsum ilii beneath the gluteal muscles. There is marked shortening. In all varieties of dislocation testing movements is contra-indicated for obvious reasons.

*Central Dislocation* is almost as common as the above. The limb is abducted but

rotation is variable and shortening depends on how far into the pubis the head has been driven.

The two common varieties of dislocation are complicated by injury to the *sciatic nerve* in some 10 per cent of cases, the lateral component (*see* p. 421) being affected almost always.

*Anterior Dislocation* is far less frequent and occurs when the victim falls feet-first from a height. It is possible for both joints to be dislocated. Pain and fixation of the joint are present. The limb is abducted, laterally rotated, and slightly flexed. The head of the bone button-holes the Y-shaped ligament of Bigelow, and its neck is held so fast that there is no upward displacement and no shortening.

### THE THIGH

**Meralgia\* Paraesthetica.**—The lateral cutaneous nerve is compressed as it passes through the inguinal ligament; the result is an area of hyperaesthesia in its distribution to the lateral thigh which causes the patient to complain of a tingling feeling in this region, worse on standing or walking but usually relieved by sitting.



*Fig. 877.*—Inspection of a fractured femur (neck). Note the rotation of the limb.

**Fracture of the Neck of the Femur.**—Often the patient is an elderly woman, and frequently the accident is trivial—slipping on a polished floor—which suggests that the neck of the femur is the seat of senile osteoporosis (occasionally a bone metastasis). That a fracture of the femur has occurred is usually perfectly obvious on inspection. *Fig. 877* shows the leg rotated outwards 90°, the typical deformity when the fracture is extracapsular, i.e., a low fracture of the neck. On the other hand an intracapsular fracture (high fracture of the neck) shows only 45° of external rotation, as the capsule prevents further rotation. Patel notes that in extracapsular

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\* *Meralgia*. Greek, *μηρός* = thigh + *ἄλγος* = pain.

fractures an additional sign is present—a swelling (haematoma) is found at the inferolateral aspect of the hip-joint.

When a fracture of the neck of the femur is impacted (abduction fracture), the patient can lift the heel off the bed; otherwise she is unable to do so.

Obscure injuries about the hip-joint require careful consideration. Consider the comparatively rare impacted abduction fracture of the neck of the femur; the symptoms are few—the patient may even walk to seek advice. After such an accident as has been described, even the slightest pain on rotation of the hip by *Method A* (see Fig. 857) provides sufficient data upon which to order a confirmatory X-ray.

**Fractured Greater Trochanter.**—After a fall on the side there is pain, and bruising (such as might be seen after a fractured neck of femur) is present. Maximum tenderness is over the greater trochanter and full active movements of the hip-joint are possible, although painful.

**Avulsion Fracture of the Lesser Trochanter** is rare but shows a unique sign. It occurs in school-boys, and is caused by vigorous contraction of the psoas muscles as, for example, when hurdling.

*Ludloff's Sign.* The sitting patient is unable to flex the affected thigh but all other movements are present. The ilio-psoas muscle is an important flexor of the hip-joint.

**Fracture of the Shaft of the Femur.**—No other long bone fracture results in so much shock due to the large amount of blood that is extravasated into the thigh. As a rule the limb lies rotated laterally. Often it is obviously deformed, the patient cannot move the limb, and real shortening is present. In this instance the diagnosis presents no difficulty.

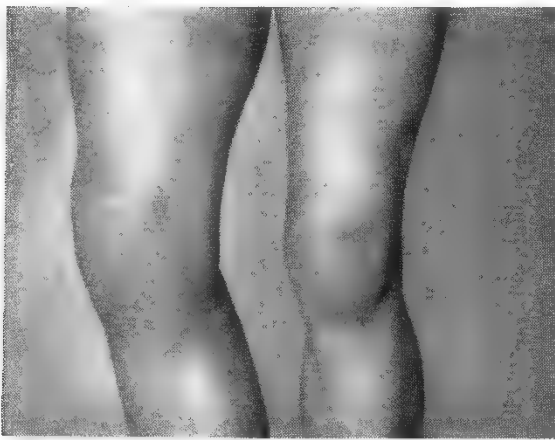
**Fractures of the Lower End of the Femur** are so closely related to the knee-joint that they are considered in the next chapter.

## CHAPTER XXXIV

## THE KNEE-JOINT

FOR an examination of the knee-joint the lower limbs should be bare. The patient is examined first in the upright position, both anteriorly and posteriorly, secondly seated, thirdly supine, and finally prone. In the supine position the hip-joint should be examined if there is no obvious abnormality in the knee, as pain is sometimes referred from the hip to the knee. In cases where the diagnosis is straightforward the examination may be concluded before the whole of the ritual is complete, but with the exception of localized swellings, usually it is unwise to curtail any part of the routine procedure. In particular, to omit to examine the popliteal space often proves a matter for regret.

**Effusion into the Knee-joint.**—To commence, consider the physical signs of fluid in the joint, irrespective of whether it is the result of a recent injury or not.



*Fig. 878.*—Traumatic effusion into the knee-joint. Note the obliteration of the normal outline of the joint when compared with the other knee.



*Fig. 879.*—Large effusion into the knee-joint of many weeks' duration. Note the fullness caused by ballooning of the suprapatellar pouch.

*Inspection with the Patient Standing.*—Fluid in the joint can often be seen (*Fig. 878*). Look particularly for a fullness above and on either side of the patella. 'If the surgeon, on passing his eyes critically over the natural hollows on each side of the patella, finds them abolished, he may be absolutely certain that he has to deal with an effusion into the knee-joint' (Whitelocke). In large effusions, especially in chronic cases, the distended suprapatellar pouch often is outlined as a horseshoe-shaped swelling (*Fig. 879*) because of wasting of the quadriceps femoris muscle.

*Testing for the Presence of Fluid in the Knee-joint.*—Should inspection suggest that there is an effusion an early opportunity should be taken to confirm the presence of an excess of intra-articular fluid. The only conditions likely to be confused with an intra-articular effusion are: (*a*) superficial cellulitis; and (*b*) prepatellar bursitis. Fluid in the joint is demonstrated in the following ways:—

*Substantiating Continuity of a Supra- and Infrapatellar Swelling.*—If the amount of fluid is considerable, transmitted fluid impulse can be elicited from *below* the patella on one or other side of the ligamentum patellae, to that part of the swelling two finger-breadths *above* the upper border of the patella—a point manifestly well clear of a distended prepatellar bursa (*see* p. 521).

*The Patellar Tap.*—This is a pathognomonic sign. It is essential to realize that in the horizontal position a considerable amount of the excessive synovial fluid gravitates into the suprapatellar pouch. With one hand placed above the patella as



Fig. 880.—Testing for a patellar tap.

shown in Fig. 880, exert downward and backward pressure on the suprapatellar pouch, and drive fluid from that cavity into the knee-joint proper. With the index finger of the other hand, depress the patella with a sharp, jerky movement. Should the characteristic tap be felt, it is proof positive of the existence of excessive fluid in the joint. Too much fluid can prevent the patella being pushed on to the condyles; too little will not lift the patella free from them (Ovens). There must be a *moderate* amount of fluid for this test to be positive.

*Test for a Small Amount of Fluid in the Knee-joint.*—By compression, displace the fluid from one of the obliterated hollows on either side of the ligamentum patellae into the knee-joint proper. In a good light, watch; the hollow refills slowly. Even a small effusion can be confirmed by this test.

**Traumatic Synovitis** is not a diagnosis; it is a sign of injury (Smillie). There is usually an interval of several hours between the injury and the appearance of the swelling, whereas in acute traumatic haemarthrosis swelling is apparent within half an hour. Varying mixtures of blood and synovial fluid will give rise to a swelling noticed between these two periods.

**Haemarthrosis.**—In addition to the short interval between the injury and the appearance of the swelling, that the joint is filled mainly with blood, as opposed to synovial fluid, is indicated by the following signs: the knee feels slightly warmer than normal; the swelling is tense and extremely tender; later it feels doughy.

Like traumatic synovitis, but even more emphatically, haemarthrosis is not a diagnosis but a sign of intra-articular ligamentous tearing, of a torn meniscus, or of a fracture into the joint, each of which, in due course, must be sought. An



X-ray is thus essential, but in addition, in order to elucidate the signs to be described, if no fracture is found, aspiration of the joint with full aseptic precautions and under anaesthesia is necessary.

In cases where the signs point to haemarthrosis, yet the accident was trivial or non-existent, focus attention on the possibility of haemophilia (*see* p. 448).

**Examination of the Movements of a Recently Injured Knee-joint** may yield valuable information, e.g., localized tenderness over the medial collateral ligament; loss of full extension. On the other hand, the examination is often disappointingly uninformative because voluntary muscle spasm of an apprehensive patient makes detailed examination impossible (Bonnin). *In these circumstances any attempt to move the joint must be postponed for a few days*, when the examination is likely to be attended by more satisfactory results.

**Testing Flexion and Extension.**—Should there be free fluid in the joint, full flexion of the joint (normally the knee flexes until the calf meets the thigh) will be curtailed. Likewise full extension is not possible, the fluid preventing the last part of the movement of the leg and thigh into a straight line.

**Examination of the Joint in a Case other than One of a Recent Trauma.**—It is almost needless to say that the presence of a scar (or scars) should be noted, and, if present, the patient interrogated concerning it.



*Fig. 881.* —Patient pointing to the spot where he experiences pain (recurrent displacement of the medial meniscus). The site of pain when the medial ligament is torn is indicated also (II).

**The Pointing Test.** —If pain in the knee is the leading symptom ask the patient to point with one finger to the site of the pain. In torn medial meniscus this sign is often particularly valuable (*Fig. 881*). If the patient has felt 'something moving about in the joint', ask him to try to find the 'joint mouse' himself.

**Wasting of the Quadriceps.**—Inspection and comparison with the opposite side will reveal any wasting of the quadriceps muscle; indeed, a better estimation of loss of volume and of tone of this tripartite muscle is obtained by inspection and palpation than by the use of a tape-measure. This is true particularly of a limb which is well covered with subcutaneous fat. The eyes should be directed especially to the vastus medialis, which, in internal derangements of the knee-joint of some standing, wastes first and wastes most.

While if the knee-joint is insecure the vastus medialis wastes apace, the converse is also true, for when this muscle is paralysed or irreparably injured, an otherwise normal knee-joint becomes insecure.

**Testing Movements.**—The Neutral Position is with the knee straight. Ask the patient to bend his knee as fully as possible (maximum flexion =  $135^{\circ}$ ), and then to straighten it. Measure the degree of flexion and extension attained.

**Palpation of the Joint.**—One should acquire the habit of looking upon the knee-joint, not as a mere hinge, but as a two-component joint. The patello-femoral component often is neglected in routine examination, yet not infrequently it can provide helpful, and sometimes cardinal, information regarding intra-articular pathology. While the patient is still lying on his back, palpate deeply and systematically beneath the overhanging edges of the patella for tenderness. Next, push the patella laterally. This permits direct palpation of a small portion of the articular surface of the medial condyle of the femur.

**Passive Movements.**—With the left hand laid upon the joint, grasp the ankle with the right; flex and extend the knee-joint several times (*see Fig. 31*, p. 15), noting if there is joint crepitus or a click.

**Significance of a Click.**—An intra-articular click is not necessarily due to a torn meniscus. A painless click as the patella moves over the condyle sometimes occurs in a normal joint, especially during childhood. The importance of a click is 'Is it accompanied by discomfort or pain?'; 'Does the patient associate the sound with the "sickening" sensation that heralds the attack of which he complains?' If not, (a) test the lateral mobility of the patella (*see p. 529*); (b) test the other knee-joint—a click occurring in a normal joint frequently is bilateral.

**Differential Diagnosis of a Click.**—An intra-articular click can in some respects be simulated by the sound of a snapping tendon such as produced by semitendinosus slipping around and becoming hitched over the medial condyle, or the tendon of biceps over the head of the fibula, or the edge of the iliotibial band over the lateral condyle—or any tendon in the neighbourhood becoming hooked over an exostosis. Provided the phenomenon can be reproduced at the time of the clinical examination, an extra-articular snap should not be confused with an intra-articular click, for the extra-articular sound is a dull thud, often accompanied by a shudder, and the tendon implicated can be seen and felt as a tense sinew.

### INTERNAL DERANGEMENTS OF THE KNEE-JOINT

This is an old term\* which is something of a blunderbuss, and includes such conditions as a tear of a collateral ligament and bruising of the infrapatellar fat-pad, neither of which is intra-articular. It is hoped that with increasing experience the reader will use the term less and less, and as a result of augmented clinical acumen will specify more often *which* derangement is present. The term covers the conditions which follow up to, but excluding, 'Injuries of the Extensor Apparatus' (p. 527). It is convenient to deal first with the signs of lesions of the menisci, the commonest cause by far.

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\* Introduced by William Hey in 1803. Smillie notes that the abbreviation 'I.D.K.' also stands for 'I don't know'.

## LESIONS OF THE MENISCI

These are very common in males, particularly among footballers and coal-miners. With the knee flexed and weight-bearing, a twist occurs with sufficient violence to tear a meniscus. As usually the twist is in a medial direction, and as the medial is longer and more securely attached than the lateral, the medial meniscus is injured more often than the lateral meniscus in the ratio of about 5 : 1 (Smillie). The types of medial meniscal rupture, in order of frequency, are: (1) bucket-handle;\* (2) posterior horn tear; (3) anterior horn tear.


In Japan the ratio of medial to lateral is 1 : 4 (Amako). Presumably the disparity is explained by anatomical differences.

In making any diagnosis there is no gain-saying that a meticulous history is almost always a helpmate and usually a co-partner of physical signs, but in this instance the history often assumes the major role—at any rate in that most frequent of these lesions, the bucket-handle tear of the medial meniscus—for in these cases between the attacks there are often no physical signs whatsoever. So it comes about that the bucket-handle lesion has been called the ‘cartilage of symptoms’ as opposed to the posterior horn tear, which has been styled the ‘cartilage of signs’ (Teece). The latter synonym implies that, as the history is indefinite, reliance must be placed on physical signs. It should also be noted that an injury severe enough to cause a torn cartilage seldom allows of normal activities afterwards (e.g., completion of a game of football).

*‘Giving Way’ or ‘Letting Down’.*—This is a symptom for which the clinician should listen carefully, but not suggest to the patient. While walking or, more frequently, when stepping off a kerb or proceeding down stairs, the affected knee gives way and the patient falls. It occurs particularly with posterior horn tears, but also with old rupture of an anterior cruciate ligament, extreme quadriceps muscle weakness and loose body in the knee, conditions which must be differentiated as described in the sections that follow.

*Locking.*—Only very occasionally is the patient brought with his knee locked. His statement that his knee has ‘locked’ must always be qualified. Ask him to demonstrate the position in which the knee became fixed (10° short of full extension is the position of true locking). Next inquire exactly what he was doing and what he felt at the time of the fixation. Lastly, interrogate him as to how the knee became unlocked. If the locking was true, unlocking occurred with even more dramatic suddenness than the locking. Always listen carefully for the term in the patient’s history, but never suggest it to him. Actually the word is unfortunate, because a locked door will not move, whereas a locked knee will flex but not extend. It should be noted that in only 40 per cent of cases of torn meniscus is there a history of locking, and in half of these it occurs at the original accident. That being so, in 20 per cent it is not experienced until some time after the patient has sustained a tear. In addition to a loose body (see p. 526) only a bucket-handle tear and a partially detached tag of anterior cruciate ligament are capable of causing the knee-joint to lock. The phenomenon is due to one or other of these three objects becoming

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\* Torn from its moorings, except anteriorly and posteriorly, the cartilage becomes jointed like a bucket-handle , and it can swing laterally to repose in the commodious interior of the joint, and back again to its original position, but it is never anchored.

rammed between the joint surfaces at the commencement of the screw-home movement of the medial femoral condyle.

In recurrent cases the patient learns to unlock the joint by shaking the limb or by performing a rotary motion of the joint.

*Clicking* is only a subsidiary sign. Of itself, it is not evidence of a tear. In conjunction with other positive features of ruptured meniscus it carries some weight in favour of the diagnosis.

*Atrophy of the Quadriceps.*—At least some wasting and loss of tone of the quadriceps (especially of the vastus medialis muscle) are present in every case of a tear of some duration.

*Effusion* always follows the original tearing of a meniscus because of the concomitant synovial trauma. Subsequent recurring incidents of locking or 'giving way' of the knee-joint are also followed by effusion, but the more frequent the incidents the smaller the consequent outpouring; indeed, a time may come in cases of recurrent displacement where there is no demonstrable effusion at all.

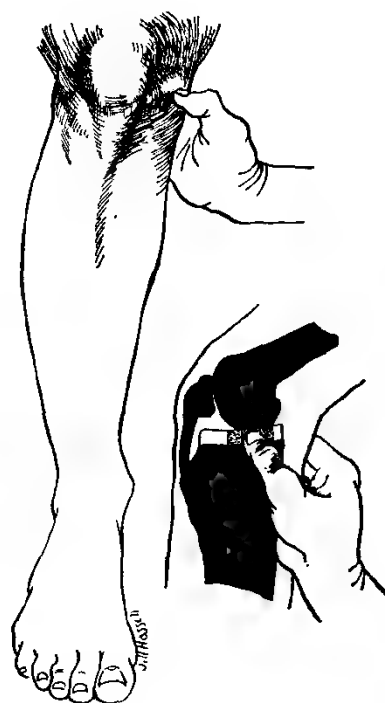
**Medial Meniscus.**—*Tenderness Anterior to the Medial Ligament* becoming apparent as the knee is extended suggests a bucket-handle tear, the cartilage being extruded between the bone-ends in this position.

*Tenderness Over the Medial Ligament* at the level of the joint-line (*Fig. 882*): this is the most constant and reliable region of localized tenderness in injuries of the medial meniscus (Smillie). Frequently, tenderness can be elicited here with the knee-joint flexed, whereas in the extended position it was indefinite.

*Tenderness Posterior to the Medial Ligament* is diagnostic of a tear of the posterior horn of the medial meniscus, provided that this diagnosis is substantiated by one of the tests about to be described.

*McMurray's Test.*—The patient lies supine on a firm couch. The knee is flexed fully until the heel approaches the buttock. One hand steadies the knee: the other hand grasps the heel, so that the forearm can be employed to carry out lateral rotation (*Fig. 883*), which tests the *posterior* half of the medial meniscus, or medial rotation, which tests the *posterior* segment of the lateral meniscus. While the foot is retained in full medial, or lateral rotation, the leg is brought from a position of acute flexion to a *right-angle*. The test is positive if a click is heard or felt by the palpating fingers during the final episode of the test, *and* if the patient recognizes the sensation he experiences at the time of the click as the one which occurs when the knee 'lets him down', i.e., there are some normal clicks (usually bilateral).

*Apley's Grinding Test.*—For this examination the patient lies on his face on a couch. He must lie well towards the side of the couch of the affected knee, and it is on this side of the couch that the clinician stands. He proceeds to grasp the foot of the affected side with both hands, and then flexes the knee to a right-angle. Lateral rotation of the foot is performed, and it is noted whether this



*Fig. 882.*—Method of seeking tenderness over that part of the medial meniscus which lies beneath the medial ligament. Tenderness localized here strongly favours an injury of the medial meniscus.



Fig. 883.—McMurray's test for a posterior tear of the medial meniscus. The foot is rotated laterally while the examiner's other hand steadies and palpates the medial side of the knee.

causes pain or discomfort—normally it should cause no more than slight discomfort. Following this, the clinician places his knee on the patient's ham, so as to fix the femur, and without changing the position of his hands he pulls the leg upwards while performing lateral rotation. If, on distraction, pain on rotation is produced, a lesion of the medial collateral ligament is diagnosed. The



Fig. 884.—Apley's grinding test; final phase. Grinding the articular surface of the tibial plateau on the articular surface of the condyle.

clinician then leans well over the patient, and repeats the test (Fig. 884) while his body-weight compresses the tibial plateau onto the condyles of the femur. If lateral rotation with the addition of compression produces increased pain, the grinding test is positive and a tear of the medial meniscus is diagnosed.

To test the lateral meniscus a reversed test is performed, the foot being rotated medially instead of laterally.

**Lateral Meniscus.**—The original accident is seldom definite; sometimes it is so trivial as to have been forgotten. Locking is uncommon, and incidents of this, or



of the knee 'giving way', are not necessarily followed by effusion, as injury of the more mobile cartilage causes less synovial reaction. Moreover, to this vague, unhelpful symptomatology must be added the fact that, for a reason as yet undetermined, *the pain can be referred to the medial aspect of the joint*. However, both tenderness to pressure and pain on manipulation are definitely on the lateral aspect, and coincide with the site of the lesion. McMurray's test and Apley's grinding test when modified to try out the lateral meniscus (as directed in the accounts of these tests) are both valuable in confirming the diagnosis.

**Combined Lesions of the Menisci.**—If the history and examination point to lesions of both medial menisci (or less frequently to both lateral menisci), such a diagnosis should be made and appropriate treatment instituted. Similarly, if the data are appropriate, lesions of both menisci of a single knee can be postulated.

**Discoid Meniscus** is an uncommon atavistic developmental anomaly, almost invariably of the lateral meniscus, in which the cartilage is not only discoid instead of semilunar in shape, but is unattached to the posterior tibial plateau. The condition is often associated with an unduly high head of the fibula. There is an unmistakable, and often easily audible, 'clunk' when the knee-joint is flexed almost fully, and another 'clunk' when the knee-joint is almost fully extended. Usually the patient is in his or her teens. These menisci are very liable to tear, in which case the signs and symptoms of a tear are superadded to the 'clunk'.

### LESIONS OF THE CRUCIATE LIGAMENTS

**Rupture of the Anterior Cruciate Ligament** comprises approximately 10 per cent of internal derangements of the knee-joint. The violence necessary to rupture this strong ligament is considerable. Soon after the accident there is a manifest haemarthrosis. Often, the diagnosis is not made for several weeks; this could be obviated by aspirating the blood and attempting to elicit the drawer sign under an anaesthetic on the day of the accident. In cases of some standing a leading symptom is instability of the joint, especially on going downstairs.

*The Drawer Sign* (likened to opening and closing a drawer) is the ability to effect an abnormal amount of movement of the head of the tibia on the condyles of the femur with the knee-joint flexed. In order to fix the limb the clinician sits on the patient's foot (*Fig. 885*). Having ascertained the amount of play between the two bones, repeat the manoeuvre on the contralateral side for comparison.

1. When the anterior cruciate ligament is ruptured the abnormal movement is forward movement of the tibia on the femur.

2. When the anterior drawer sign is much increased it can be taken for granted that the ruptured cruciate ligament is part of a dual lesion, the other component being a complete tear of the medial ligament (*see below*).

**Rupture of the Anterior Cruciate Ligament of Long Standing.**—In cases of months' or years' duration, the knee-joint can be hyperextended.

**Rupture of the Posterior Cruciate Ligament** is less common than the above. It is most often encountered as a result of the top of the tibia striking the dashboard when a front-seat passenger is thrown forward—a frequent traffic accident. The signs are similar to those of rupture of the anterior ligament, the leading difference being that the drawer sign is positive backwards, i.e., there is movement of the tibia on the femur when *backward pressure* is exerted.

In a *dislocation of a knee-joint*, a rare event, both cruciate ligaments are torn, resulting in a grossly unstable knee-joint; lateral popliteal nerve and popliteal artery injury are common.

### LESIONS OF THE COLLATERAL LIGAMENTS

**Traumatic Lesions of the Medial Ligament.**—Complete lesions are less frequent than lesions of the anterior cruciate ligament. The ligament is not, as is frequently



Fig. 885.—Testing the knee-joint for anteroposterior movement. When the anterior cruciate ligament is ruptured it is the anterior drawer sign that is positive, i.e., there is movement when the leg is *pulled forward*. Note that the examiner is sitting on the patient's foot.

depicted, a rectangular band—its posterior part fans out (Fig. 886) so as to make it triangular in shape, the apex of the triangle being attached posteriorly to the medial meniscus. A tear of this ligament is predominantly an injury of ball games



Fig. 886.—Method of seeking an area of localized tenderness over the medial ligament. Maximum tenderness over the femoral attachment signifies a tear of this ligament. Maximum tenderness over the joint-line suggests a tear of the medial meniscus.

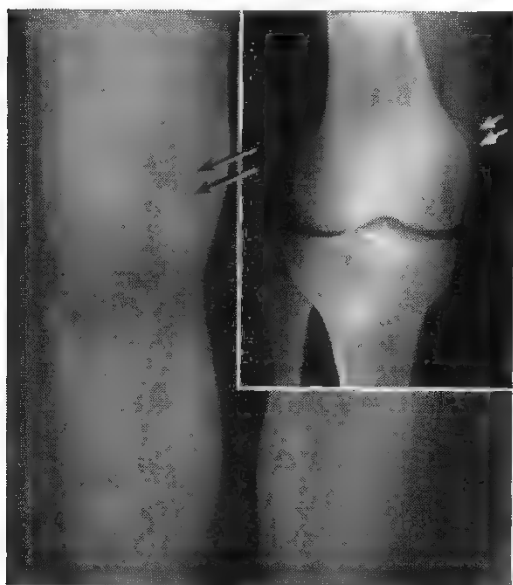
and skiing, and because forcible valgus bending of the knee occurs more commonly than varus bending, it is the medial ligament that is ruptured more frequently than its fibular counterpart. Generally the femoral attachment is torn; much less frequently it is the tibial attachment that is implicated; when it comes to the portion of the ligament related to the joint-line, this is so intimately bound to the medial

meniscus that if this part is involved, the meniscus is torn also, and consequently the diagnosis of torn medial meniscus is rightly made.

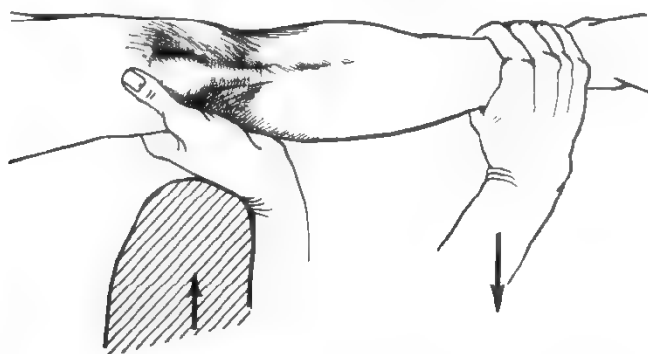
**INCOMPLETE RUPTURE.**—Although pain is severe at the time, it soon passes off sufficiently for the patient to continue his activities. In a matter of hours a moderate amount of pain returns. Some swelling (rarely ecchymosis) may be discernible over the site of the lesion.

Tenderness is present over the whole of the ligament, but is most acute over the site of the lesion (*Fig. 886*). In incomplete rupture there is *no increased lateral mobility of the joint* (*see below*), but the attempt to invoke such movement causes localized pain in the region of the damaged ligament.

**Calcification of the Medial Ligament (Pellegrini-Stieda's Disease).**—As a rule the patient is a man between 25 and 40 years of age, and following traumatic synovitis (due to incomplete rupture of the medial ligament) with seemingly good progress, but not full recovery, limitation of movement of the knee-joint becomes more pronounced. Often the medial aspect of the joint is tender to pressure. As complete extension is painful, the joint is held in slight flexion. The cause is calcification in the ligament. The leading signs are that full extension of the joint is resisted and an attempt to straighten the knee causes pain limited to the femoral attachment of the ligament (*Fig. 887*). In



*Fig. 887.*—Pellegrini-Stieda's disease.



*Fig. 888.*—Method of testing lateral mobility.

the early stages there is not only tenderness over, but thickening of, this part of the ligament. In 6–18 months a bony prominence can be felt and sometimes seen on the medial aspect of the femoral condyle. By this time the condition is much less disabling. Radiography confirms the diagnosis.

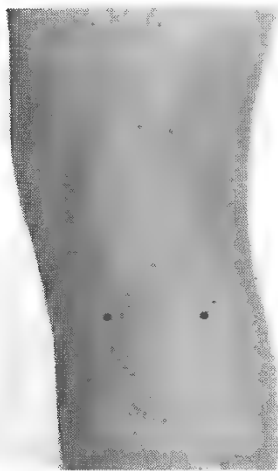
**COMPLETE RUPTURE.**—Haemarthrosis will be present if the capsule of the joint is intact. If not, the blood drains into the periarticular tissues causing a brawny haematoma. All the positive signs of incomplete rupture are present; in addition, careful palpation rarely reveals a small, movable particle of bone in the region of the femoral attachment of the ligament. In recent cases of uncomplicated complete rupture lateral mobility of the knee-joint is likely to be somewhat increased; later, if this ligament alone is ruptured, muscular spasm makes lateral mobility difficult to elicit, but the attempt to produce lateral rocking evokes pain on the inner side of the knee-joint. Note that *pronounced lateral mobility* of the knee-joint occurring recently or remotely after an accident signifies that a *dual* injury occurred—complete rupture of the medial ligament plus rupture of the anterior cruciate ligament.

**Test for Lateral Mobility.**—With the knee-joint extended fully, try to elicit

abnormal lateral movement in the manner shown in *Fig. 888*. With the patient seated, the leg is lifted by one of the examiner's hands, holding the back of the knee in such a way as to hook the fingers beneath the upper part of the popliteal space. The free hand is used to grasp the leg above the ankle. The examiner (who is standing) then braces his own knee against the back of his hand supporting the knee while with the other hand he exerts lateral traction on the leg in the direction of the right arrow. It is essential to compare the amount of lateral movement with that of the opposite knee-joint. In the normal joint there is virtually no lateral play.

**Lesions of the Lateral Ligament.**—This is rounded and cord-like, attached to the lateral condyle of the femur above and to the head of the fibula below, and very strong. On this account, and because adduction injuries are comparatively rare, this ligament is torn much less frequently than its tibial counterpart. The resulting injury is, however, of great importance, because frequently complete rupture is associated with injury of the lateral popliteal nerve (*see p. 421*).

The ligament is palpated in much the same way as described for the medial ligament, noting that as a rule it is the *lower* (fibular) end of the ligament that is torn, and in cases of complete rupture not infrequently the head of the fibula is avulsed, and can be felt to move and to crepitate.



*Fig. 889.*—Sites of tenderness in Hoffa's disease.

#### OTHER CAUSES OF INTERNAL DERANGEMENT

**Hoffa's Disease** (nipping of infrapatellar fat-pad or synovial fringes).—The fat-pads on *both* sides of the ligamentum patellae are tender to pressure (*Fig. 889*) and forcible extension of the knee may reproduce the pain complained of. Usually the sufferer is obese and the condition is thus commoner in females.

**Loose Body.**—Often the symptoms are not unlike those of a torn medial meniscus (including letting down), but the absence of a history of previous injury to the knee should direct attention to the possibility of a loose body. In the beginning, often the only complaint is vague pain in the joint, made worse by exercise, and attacks of recurrent effusion that subside rapidly. To these symptoms one day is added locking, which occurs unheralded. Classically the patient volunteers the information that he 'feels something moving about in the joint'; a few declare that they have been able to locate and temporarily imprison a loose body between a finger and thumb.

A completely detached loose body is wont to be located at different positions on successive occasions. From time to time it remains attached to a pedicle, occupies a more or less constant position, and can be found fairly readily on routine palpation. It is advisable to request the patient who gives a history of locating a foreign body in a joint to repeat the feat, because for the clinician to fail to catch the 'joint mouse' and then for the patient to succeed, creates a situation that is best avoided.

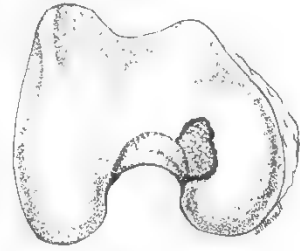
In those of advancing years, osteoarthritis is the most common cause of a loose body or bodies in a joint, in this instance a detached, or partially detached, osteophyte. Routine radiographs, ordinarily normal in internal derangements of the knee-joint, are taken in every case to eliminate a loose body or bodies in general, and osteochondritis dissecans in particular.

**Osteochondritis Dissecans** is the commonest source of loose bodies in young persons, 80 per cent of whom are males. This curious disease is occasionally familial and often bilateral, and is characterized by ischaemic necrosis and partial detachment of a fragment of cartilage with a flake of underlying bone from the articular surface of the medial condyle of the femur, always in exactly the same place, viz. —————→

Possibly, it has been conjectured, this phenomenon is due to repeated impingement of the spine of the tibia against the condyle of a joint with a peculiar anatomical configuration.

In addition to letting down and locking, episodes of pain and effusion recur, until the fragment or fragments (rarely more than two) are extruded into the joint. The physical signs are as follows:—

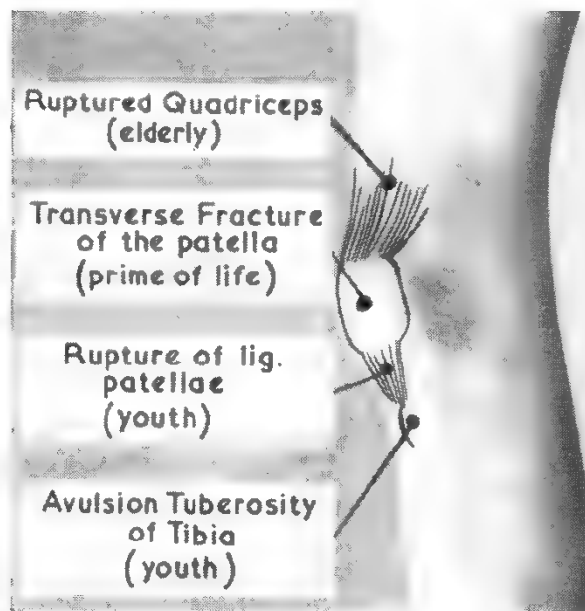
(1) When the knee-joint is flexed, firm pressure over the inferior aspect of the condyle of the femur bereft of the patella produces exquisite tenderness; occasionally incongruity of the articular surface is palpable; (2) Like chondromalacia patellae (*see p. 529*), if the patella is pressed on the medial condyle there is unmistakable tenderness.



### INJURIES OF THE EXTENSOR APPARATUS OF THE KNEE

Viewed through morphological spectacles, the patella is a sesamoid bone situated in a tendon of the extensor muscular mechanism as it passes over the knee-joint. Lesions due to sudden, violent contraction of the powerful quadriceps

*Fig. 890.*—The principal traumatic lesions of the extensor mechanism of the knee-joint tend to vary with the patient's age.



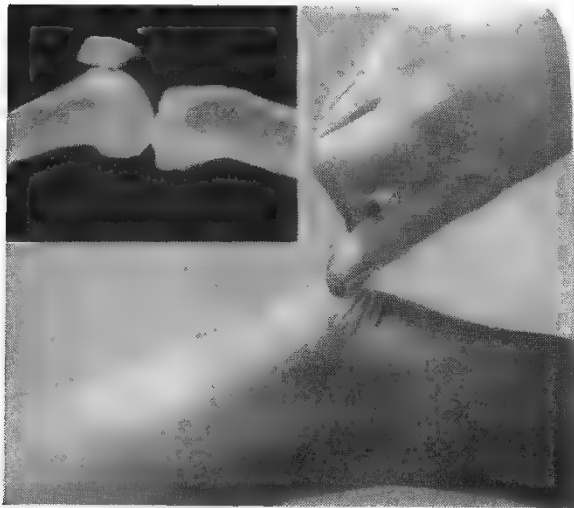
muscle (as might be occasioned on stumbling on a stair or catching the foot while walking or running) are considered here. To a remarkable extent, the site of the damage is governed by the patient's age (*Fig. 890*).

**Rupture of the Rectus Femoris Muscle** occurs at the musculotendinous junction, well above the knee-joint. The injury can be strongly suspected on inspection, for the knee is held in a semiflexed position and there is an absence above the patella of the normal fullness due to the suprapatellar pouch. Later the contracted avulsed muscle-fibres form a characteristic lump which becomes harder and larger when the patient is requested to brace the muscles of the thigh. Distal to the lump there is a gap into which the finger-tips sink.

**Transverse Fracture of the Patella** is always accompanied by haemarthrosis.



Separation of the fragments, which is frequent, occurs only if the medial and lateral expansions of the quadriceps tendon are torn also. When separation exists the knee-joint is semiflexed, and the patient is unable to extend the joint actively. If there is a great deal of separation a layman knows what has happened. A useful method of examining a doubtful case is to pass the thumb-nail, held nearly horizontal with the surface, over the subcutaneous surface of the patella from above downwards (*Fig. 891*). When even the slightest separation is present, a sharp crevice will be felt.



*Fig. 891.*—The thumb-nail test for fractured patella without separation.

**Rupture of the Ligamentum Patellae.**—A tender, puffy swelling occurs directly over the ligament. After the tumefaction has subsided somewhat, the breach in continuity of the ligament can be discerned by finger-tip palpation. However, the pathognomonic sign of rupture of the infrapatellar ligament is an upward shift of the patella.

**Osgood-Schlatter's Disease (Tibial apophysitis\*)**, which is common, is a traction injury of the tuberosity into which the central part of the ligamentum patellae is inserted. Often the history of a specific injury is lacking. A young adolescent complains of pain after exercise in the region of the tuberosity of the tibia, and here a tender, bony lump (*Fig. 892*) is situated. Such signs are present regularly and are pathognomonic. Occasionally the disease is bilateral.



*Fig. 892.*—Osgood-Schlatter's disease. Inset shows the partially avulsed apophysis.

### THE PATELLA

**Recurrent Dislocation of the Patella.**—The tendency of females to genu valgum and the relatively small size of their patellae render them much more liable to recurrent dislocation, which occasionally is bilateral. Teenagers are especially prone.

\* *Apophysis*. Greek, ἀπό = from + φύσις = growth. A projection of some part, as of a bone.

On the occurrence of dislocation, suddenly the knee gives way, and usually the patient falls to the ground. With recurrent dislocations the attacks are painful, followed by swelling of the joint. As the dislocations become habitual, so these unpleasant accompaniments lessen. If the knee is seen while the patella is dislocated the diagnosis cannot be mistaken. Between attacks the signs are as follows:—

1. *Wasting of the Quadriceps*.—In cases of some standing the rectus femoris and especially the vastus medialis muscles are wasted.

Fig. 893.—Referred as a case of possible tear of the medial meniscus, the patella could be manipulated into the position shown when the knee was flexed.



2. *Excessive Lateral Mobility of the Patella* suggests the possibility of recurrent dislocation which is possible only when the knee-joint is flexed while the patella is displaced laterally (Fig. 893). More usually the patient resists this manœuvre, saying that it brings on the pain. So frequently does this result in the misdiagnosis of torn medial meniscus that every woman giving a history consistent with that of an internal derangement of the knee-joint should be suspected of suffering from recurrent dislocation of the patella until the contrary has been proved.

**Chondromalacia Patellae** is characterized by fissuring and flaking of the articular surface of the patella, commencing on its medial facet. In some cases there is a history of a direct blow on the patella; in others it is an aftermath of recurrent dislocation of the patella; but in the majority there is no apparent cause. Often the patient is a young adult female, or a male who cycles for sport. Pain is made worse by kneeling or by climbing or descending stairs, when contraction of the quadriceps femoris pulls the patella against the femoral condyles. Examination often reveals a small effusion but after this has subsided, usually movements of the knee-joint are full and painless, but sometimes there is a 'catch' when flexing or extending the knee-joint. In some instances a tender, irregular, hypertrophied synovial fringe can be felt at the margins of the patellar cartilage. Localized pain on pressing the patella against a condyle, usually on the medial aspect, is present invariably. When the knee-joint is moved while keeping a finger on the patella so as to press it against the condyles, unmistakable patellofemoral crepitus becomes apparent. Unless advanced, radiography is of no assistance because the bone is not involved.

In a few patients the disease becomes chronic, when detached or partially detached flakes set up general arthritis of the joint, and eventually the condition becomes indistinguishable from that of osteoarthritis, which in fact is present.

**Stellate Fracture of the Patella** arises as a result of a direct blow on the patella. The signs are very similar to those of a transverse fracture, with the obvious difference that the transverse crevice of the latter is not in evidence. Bruising of the skin is much more marked.

### ARTHRITIS OF THE KNEE

**Acute Pyogenic Arthritis** is relatively common in children. The general signs are pronounced. The affected knee-joint is swollen and is held in constant, moderate flexion. The overlying skin is sometimes slightly reddened, and is always warm when compared with that of the opposite side. There is exquisite pain on the slightest movement.

It is imperative to exclude osteomyelitis of one of the bones entering into the formation of the joint, particularly the lower end of the femur, for in these cases there is often a 'sympathetic' effusion into the joint, which later sometimes becomes purulent (*see p. 427*).

**Subacute Arthritis Secondary to Urethritis.**—The knee-joint is attacked more frequently than any other joint. Gonococcal arthritis has become very uncommon because of the effective control of gonorrhoea by antibiotics. On the other hand, non-specific urethritis and Reiter's disease (*see p. 449*) have become relatively common, and it behoves the clinician to remember to focus attention on the urethra and prostate (*see Chapter XXV*) in every case of subacute arthritis in which he cannot readily account for the painful effusion.

**Tuberculosis of the Knee-joint.**—The typical case at the present time is a patient, usually between 9 and 30 years of age, complaining of swelling of the knee-joint (*see Fig. 758, p. 446*) accompanied by moderate pain of two to four months' duration. In 50 per cent of cases a history of injury is given as an initiating cause (Rose). Usually there is a substantially full range of movement in the knee-joint, although in the more acute cases slight flexion deformity is present. There may or may not be an effusion into the knee-joint, but in the latter event, if the patella is pushed laterally, thickening of the synovia is likely to be discerned. Frequently, on systematic palpation, enlargement of one or more lymph-nodes will be discovered in the groin of the same side. Examination of the aspirated effusion or synovial biopsy are recommended for diagnosis.

**Osteoarthrosis.**—The knee-joint is a more frequent site than any other joint. Creaking knee-joints and difficulty in mounting stairs are one of the penalties of advancing years, and these cases, particularly common in obese, short, females, require no special comment here. Monarticular osteoarthrosis of the knee-joint is much less common than the polyarticular form, and almost always it has a traumatic background. An old bony injury, a long-standing internal derangement (even if it was eventually remedied by an operation), recurrent dislocation of the patella or genu valgum are all precursors. Crepitus is elicited easily in this joint, and it is of the creaking, muffled variety when the articular outgrowths are cartilaginous; later, when the cartilage has become eroded, harsh grating is experienced. Osteophytes should be sought by systematic palpation of the joint.

### THE POPLITEAL SPACE

When the knee is being examined the popliteal space is liable to be overlooked. The space is examined best with the patient lying face downwards (*Fig. 894*). Cystic

lesions (*see below*) are not uncommon, while the following entities are seldom seen.

**Popliteal Aneurysm.**—Atherosclerotic aneurysms are still encountered and the popliteal space remains the commonest site of a peripheral aneurysm although syphilitic aneurysms are now rare. Consequently in a mature or elderly person always test a centrally placed swelling of the popliteal space for an expansile impulse (*see p. 27*). If such an impulse is found examine the opposite side carefully as these aneurysms are frequently bilateral.



*Fig. 894.*—Palpating the popliteal space.

A **Popliteal Abscess** is often deep seated; there is but slight fullness of the space. The patient inclines to keep the knee-joint somewhat flexed; full extension causes pain. When a popliteal abscess is suspected, the foot and leg must be scrutinized for an infected focus. Commonly the abscess arises from infection of the lymph-nodes of the popliteal space via lymphatics, from a sore on the heel. In this situation fluctuation occurs late; tender induration should suffice to make the diagnosis. The result of undue delay in opening the abscess can be crippling.

**Nerve Tumours.**—When a patient presents with what appears to be a typical enlarged bursa in the popliteal space, but it is tender and, when pressed, pain shoots down to the foot, almost certainly the swelling is a tumour of either the medial or (if in relation to the deep aspect of the biceps tendon) the lateral popliteal nerve.

### CYSTS ABOUT THE KNEE

These swellings are common and no candidate in a surgical examination can expect to pass if he misdiagnoses one of them.

**In Front of the Knee.**—These are the commonest.

**Prepatellar Bursitis** (Housemaid's Knee) is accounted the most elementary diagnosis in surgery. In this servantless age it is certainly an anachronism to retain its synonym, for there are now but few housemaids, and they rely more on the vacuum cleaner than on the brush and dustpan. Today housewives, charwomen, and coal-miners are chiefly affected.

The prepatellar bursa is subcutaneous. It covers the lower half of the patella and the upper half of the ligamentum patellae (*Fig. 895*), and the bursitis is caused by friction between the skin and the patella. The distended, uninfected bursa constitutes a most typical circumscribed swelling which permits the sign of

fluctuation to be demonstrated in an arresting manner. This bursa is particularly liable to become infected, in which event signs of inflammation of the swelling are classical (*see p. 31*).



Fig. 895.—Prepatellar bursitis (housemaid's knee).



Fig. 896.—Infrapatellar bursitis (clergyman's knee).

*Infrapatellar Bursitis* (Clergyman's knee) (Fig. 896).—Again, although the synonym serves to call attention to kneeling with the trunk upright, and consequent trauma in the region of the tibial tuberosities, as opposed to the patellae (when kneeling 'on all fours'), the synonym is not now representative. Case records show that roof-felters, parquet-floor and carpet layers, and those who follow trades in which this type of kneeling is indispensable, are the chief sufferers, while housewives follow a good way behind for second place.

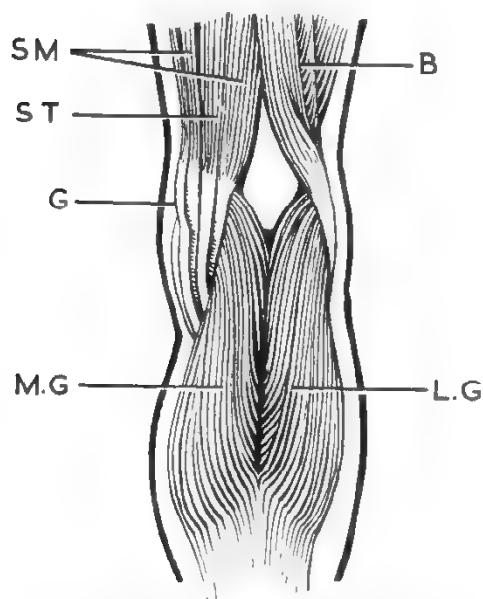


Fig. 897.—Tendons and muscles at the back of the knee-joint. SM, Semi-membranosus; ST, Semitendinosus; G, Gracilis; M.G, Medial head of gastrocnemius; B, Biceps femoris; L.G, Lateral head of gastrocnemius.

**At the Back of the Knee.**—It will be profitable to refresh the mind concerning the relationship of tendons and muscles that are inserted, or arise, in the region of the medial boundaries of the popliteal space (Fig. 897).

*Semimembranosus Bursa.*—This is the most common swelling of the popliteal space. The bursa lies between the medial head of the gastrocnemius and the semi-membranosus tendon. The swelling is tense when the knee-joint is extended; more flaccid when the joint is flexed. If the swelling is compressed it remains stationary in size—for it does not communicate with the joint. There is no crepitus on moving the joint, the excursions of which are full unless the cyst is very large. It is found in both sexes from childhood to beyond middle age.

*Baker's Cyst.*—When a swelling in the popliteal space is situated more centrally, and the patient is over 40 years of age, it is likely to be a Baker's cyst, which sometimes

is bilateral. This swelling arises as a pressure diverticulum of the synovial membrane through a hiatus in the capsule of the knee-joint. It is always located in the midline at or below the level of the joint and stands out when the knee is



fully extended but, unless very large, disappears when the knee-joint is even slightly flexed.

Having ascertained that the swelling is cystic, compress the swelling; should the lumen of the stalk be patent, as it is except in cases of long standing, some of the contents of the cyst can be displaced into the knee-joint, rendering the cyst more flaccid. Because the communicating channel sometimes is small, the pressure must be exerted for some moments. Next test the knee-joint for signs of osteoarthritis. As a rule, these and other bursal swellings around the knee-joint are practically painless, and are not tender: also more often than not they are semitranslucent. Unlike bursae situated on the anterior aspect of the knee-joint, they seldom become inflamed.

While osteoarthritis is the most common cause, any effusion into the knee-joint of long standing can give rise to a Baker's cyst—for instance, a (posterior) tear of a meniscus which has been overlooked (Childress). In relevant cases this lesion should be excluded by appropriate tests, otherwise if the cyst alone is removed, recurrence is inevitable.



Fig. 898.—Enlargement of the bursa anserina.



Fig. 899.—Cyst of the media meniscus.

#### On the Medial Side.—

*The Bursa Anserina.\**—Interposed between the tendons of the sartorius, gracilis and semitendinosus (see Fig. 897) superficially, and the medial ligament on its deep surface, lies the bursa anserina, which, when distended, comes to the surface in the position shown in Fig. 898.

*Cyst of the Medial Meniscus (Fig. 899).*—If small, the patient is unlikely to be aware of its presence, and comes complaining of a dull pain in the region of the cartilage, accentuated by violent exercise and relieved by rest. As it becomes large enough to attract attention, the pain becomes less, and in many instances departs altogether. A small cyst is situated directly over the line of the joint, but, because an enlarging cyst follows the path of least resistance, as it enlarges it is liable to overlap the line of the joint more in one direction than in another. When large enough to be visible, a characteristic sign is that the anteroposterior diameter is greater than the vertical diameter.

While still comparatively small, the cyst is wont to disappear on acute flexion of the joint and to reappear on extension, reaching its maximum dimensions when the knee-joint is nearly, but not quite, fully extended. This *disappearing sign* is common (Pisani).

The cyst can protrude through the tibial collateral ligament, or come to the surface in front

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\* *Anserina*. Latin, *anser* = a goose. Likened to a goose's foot.

WILLIAM M. BAKER, 1839–1896, *Surgeon, St. Bartholomew's Hospital, London.*

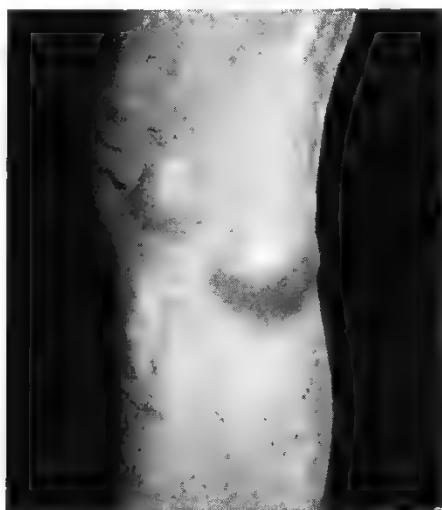
HAROLD M. CHILDRESS, *Contemporary Orthopaedic Surgeon, Jamestown General Hospital, New York.*

ANTHONY J. PISANI, *Contemporary Orthopaedic Surgeon, Bellevue Hospital, New York.*

of, or behind, the ligament. By the time the patient presents, a cyst of the medial meniscus tends to be much larger than a cyst of the lateral meniscus, and is less fixed than its counterpart.

**On the Lateral Side.—**

*Cyst of the Lateral Meniscus.*—Inexplicably this is encountered much more often than a cyst of the medial meniscus. The disappearing sign discussed above is common. It is possible for the cyst to enlarge in a posterior direction and appear in the lateral part of the popliteal space. Most of these cysts, however, emerge around the posterior border of the lateral ligament (*Fig. 900*). It is not uncommon for a cyst of a *lateral* meniscus to give rise to sufficient pain to cause the patient to seek advice before he has discovered the swelling. When too small to be seen, it feels intensely hard and is tender to pressure. It is completely immobile.



*Fig. 900.*—Cyst of the lateral meniscus.



*Fig. 901.*—Genu valgum. The distance between the malleoli is being measured by a graduated wedge.

## DEFORMITIES OF THE KNEE

In assessing the first two conditions mentioned below the patella must face directly forwards before drawing any conclusions (*see Fig. 925*, p. 554).

**Genu Valgum** (Knock-knee).—There is an abnormal curvature of the leg with the apex of the convexity disposed medially at the level of the knee. Usually the condition is bilateral. Knock-knees are so common in infancy that the condition hardly can be regarded as an abnormality. At 3 years 20 per cent of children have knock-knees of 5 cm. or more. Over 7 years this percentage is reduced to 1 (Morley). Obviously, therefore, in order to ascertain whether the condition is regressing, progressing, or stationary, it is necessary to measure and record the degree of genu valgum present, at intervals. This is done in the following way: the inner border of the feet must be parallel, for outward rotation of the feet makes the separation of the knees greater. With his knees braced back, the patient grips a postcard between his condyles (Lloyd). The distance between the medial malleoli is measured (*Fig. 901*). When the deformity is pronounced, the child walks in an unsightly manner; falls are common and synovitis is liable to develop from joint strain.

The common type of genu valgum is idiopathic, and consequent upon the somewhat faster growth at the medial compared with the lateral side of the lower epiphysis of the femur. The next common cause of the deformity is laxity of ligaments of the knee-joint which allows the knee to sag inwards, especially if the

child is overweight. When the deformity is unilateral or when it is excessive, an underlying cause of softening of the bones should be sought.

**Genu Varum** (Bow-leg) is as a rule bilateral and less common than genu valgum. Up to the age of 2 years it can be regarded as normal. The abnormal convexity is disposed laterally. As a rule it is restricted to the tibia, and is usually the result of a local error of growth of the upper tibial epiphysis but can involve the femur or both bones. The patient walks with the feet separated widely and the toes turned in. In all but minor degrees an obvious waddle is present. In early childhood, while bulky napkins are worn, an apparent bow-leg is usual ('napkin gait').



Fig. 902.—Genu varum (bow-leg).

To measure the degree of bowing the patient should lie supine, the knees extended, the patellae facing the ceiling, and the medial malleoli touching one another. The distance between the knees at the joint-line is then measured. Now that rickets is an almost extinct disease, at any rate in Britain, most examples in childhood (Fig. 902) are idiopathic. In jockeys the condition is occupational, and is due to stretched ligaments. Paget's disease of bone (*see* p. 435) is a common cause of bow-legs in the elderly.

Deformity is the only symptom. In well-marked cases that persist into adult life, osteoarthritis frequently develops eventually.

**Genu Recurvatum** usually is congenital, and is due to malposition in utero, but the deformity can result from contracture of the quadriceps femoris muscle and from malunion of various fractures about the knee. The joint is hyperextended (Fig. 903) and the ability to flex it is very limited, or virtually absent. In the congenital type the patella is small or absent, and in well-marked cases the femoral condyles can be felt in the popliteal space. The hamstring muscles are palpable as tense cords. Osteochondritis dissecans (*see* p. 527) is a frequent complication.

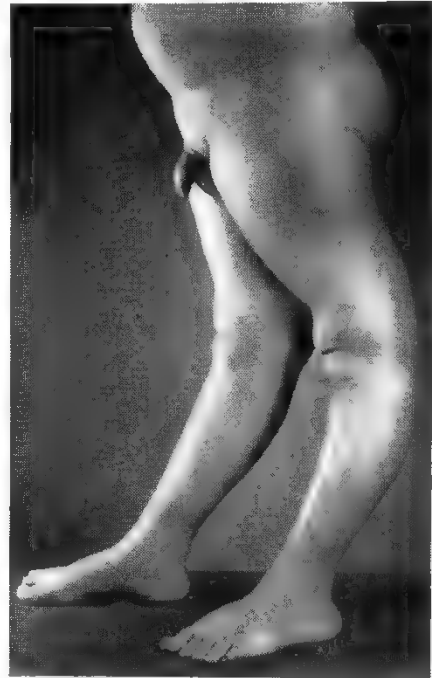


Fig. 903.—Genu recurvatum (congenital type).

### FRACTURES ABOUT AND INTO THE KNEE-JOINT

The clinical features only of the common varieties will be considered. X-rays are necessary for the diagnosis of others, and, indeed, for confirmation of the following:—

**Supracondylar Fracture of the Femur** is confined to adults. There is much swelling above the patella, extreme tenderness, and the patient cannot move the limb. As a rule, displacement is not great, but in some instances the lower fragment is rotated backwards by the pull of the gastrocnemius muscle, viz. —————→ and the shaft overlies it in front. The cardinal importance of this is that the popliteal vessels are liable to compression. Therefore *always palpate the foot pulses* (see p. 389) when this fracture is suspected. This applies with the comparable fracture in children (*displacement of the lower femoral epiphysis*).

**Femoral Condyle Fractures.**—One condyle may be driven upwards, or both condyles wedged apart from a T-shaped fracture into the joint. There is obvious widening of the transverse diameter of the knee, and all the signs of haemarthrosis (see p. 517).

**Fracture of the Lateral Condyle of the Tibia** is also known as 'bumper fracture', but actually it is not often due to the impact of an automobile bumper on a pedestrian's leg. Usually a patient over 50 years of age falls with the knee-joint extended and bent somewhat medially. The lateral tibial plateau is depressed and valgus deformity may be obvious. A haemarthrosis is present. The other essential feature is a tear of the medial ligament and/or the anterior cruciate ligament. These should not be sought for, even under anaesthesia, as the damage may well be worsened: injury must be inferred and appropriate treatment instituted.



## CHAPTER XXXV

## THE LEG AND ANKLE-JOINT

**Fracture of the Tibia and Fibula** is a common accident in men in the prime of life. This dual fracture is the commonest compound fracture and becomes so as a result of a concomitant laceration of the overlying tissues produced either by a direct injury or by a sharp end of one bone (usually the upper fragment of the tibia) transfixing the skin. Normally the medial side of the great toe, the medial malleolus, and the medial side of the patella are in a straight line; this relationship is lost when both the tibia and the fibula are fractured. Frequently the foot is rolled outwards, and deformity is obvious, in which event no attempt should be made to palpate or move the leg for fear of inflicting further damage, but the pulsation of the dorsal pedis artery should be sought. As a rule the fibula is broken at a higher level than the tibia.

**Fracture of the Shaft of the Tibia alone.**—*a. In a Young Child:* After a fall, although able to stand, he or she refuses to take weight on the injured leg. When recumbent, active movements of the knee are possible; indeed, there is little amiss to be made out on inspection, for the fracture is a long spiral one, with little displacement. Localized bone tenderness (*see Fig. 753, p. 442*) is useful in confirming the necessity for an X-ray.

*b. In an Adult.*—A direct blow, such as a kick, is liable to result in a transverse or slightly oblique fracture, and although the skin is often broken the wound is frequently superficial. At first sight it appears that the fracture is compound, but on examination in the operating theatre this is found not to be so, i.e., the wound does not extend down to the bone.

**Fracture of the Shaft of the Fibula alone.**—A direct blow on the fibula sometimes causes a transverse fracture at the site of impact. This fracture is confined to adults. As a rule the patient is able to stand. Localized bone tenderness is present (*see Fig. 753, p. 442*).

**Springing the Fibula.**—With the patient lying supine on a couch, the clinician stands on the medial aspect of the affected limb and grasps the knee in one hand and the heel in the other. Placing his own knee against the *medial* aspect of the midleg, the limb is pressed against this fulcrum. In this way the crack in the fibula is opened up and pain occurs at the fracture site. Fractures of the lower end of the fibula are so often associated with injuries of the ankle-joint that they are best considered with them (*see p. 545*).

**Stress Fracture of the Tibia** is an incomplete fracture involving only the cortex of the bone. It is confined to athletes,\* ballet dancers, and soldiers in training and manifests itself insidiously as a dull, gnawing pain in the shin coming on at shorter and shorter intervals after strenuous exercise, lasting for some hours, continuing at night, but rarely severe enough to keep the patient awake for long periods. Eventually it necessitates giving up the exercise that caused the lesion.

**Deep Palpation over the Shin** reveals a localized area of acute tenderness nearly always along the medial border of the subcutaneous surface of the tibia.

**Springing the Tibia.**—The technique is the same as for springing the fibula (*see above*) but the clinician stands on the lateral aspect of the affected limb and places his own knee against the *lateral* aspect of the midleg. This opens up the crack of the medial cortex, causing pain at the fracture.

This is a condition in which physical signs are important, because at first it may be missed on inspection of poor-quality radiographs.

**Ischaemic Necrosis of the Muscles of the Anterior Tibial Compartment (March Gangrene).**—This more serious lesion occurs after unaccustomed or unusually severe exercise. Soldiers, hikers,

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\* Known among athletes as 'sore shin' in Britain and as 'shin splints' in the U.S.A.



and footballers are the usual sufferers. Characteristically the first symptom, stiffness followed by pain in the muscular compartment, is delayed for several hours after the exercise has finished; indeed, often until late in the evening. Before morning the anterolateral aspect of the leg has become swollen and extremely tender; it is warmer than the opposite side. By daybreak a blush of the overlying skin can be perceived. So constant is this train of events that if the condition is known, the diagnosis is simple; if not, usually thrombophlebitis is diagnosed. Unless the tight fascia is incised promptly, the underlying muscles may become gangrenous.

*Dropped Big-toe* is an early sign of this condition; extensor hallucis longus becomes paralysed as a result of increased tension in the muscular compartment and the patient cannot extend the toe.

### THE CALF AND THE TENDO ACHILLIS\*

**Rupture of the Tendo Achillis.**—As a rule the patient is a male about 50 years of age. More often than not the rupture is complete, and occurs at the narrowest part of the tendon, about 5 cm. above its insertion. The injury is not infrequent in tennis and badminton players. There is sudden, agonizing pain, as though the patient had received a direct blow upon the tendon: he is unable even to limp without severe pain. The signs are: when observed in the position shown in *Fig. 904* the affected foot is held in less equinus than normal. There is a gap into which a finger can be inserted at the site of a complete rupture. The belly of the calf muscles appears as a ball-like lump retracted towards the popliteal space. There is an abnormal range of passive movement of the ankle-joint as compared with the normal side (absent in partial rupture). If in any doubt, the following test should be applied:—



*Fig. 904.*—Rupture of the tendo Achillis, left. The patient is attempting plantar flexion of both feet.

**Simmonds's Test.**—The patient lies prone, the calf is squeezed transversely. If the tendon is intact or incompletely ruptured, the foot, which should project beyond the end of the couch, is seen to plantar flex. If the tendon is completely ruptured, the foot remains still.

**Attrition Rupture of the Tendo Achillis.**—An incomplete rupture of the tendo Achillis is converted into a complete rupture some weeks later. The condition is comparatively painless. The patient falls to the ground, believing that he has been tripped by someone behind him.

A man was walking along the Whitechapel Road, London. He fell down, and rose in anger, hitting the man behind him, who happened to be a policeman! Later, in court, he was discharged when it was explained that he had, in fact, suffered this injury (Robinson).

**Tear of the Soleus** occurs at the musculotendinous junction. Severe pain and tenderness are experienced half-way up the calf. These are the signs formerly attributed to torn plantaris tendon, a condition which probably does not occur.

*See also The Heel, p. 557.*

### ULCERS OF THE LEG AND THEIR DIFFERENTIAL DIAGNOSIS

The lower leg is the seat of an ulcer many times more often than the whole of the rest of the surface of the body. To be familiar with the diagnosis of the various

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\* Achilles, when an infant, was dipped into the river Styx to render him invulnerable. Thenceforth he remained unprotected only in the heel by which he was held. (Greek mythology.)

forms of leg ulcers that are seen the world over is a basic necessity; for those practising in the tropics or subtropics there are other kinds of ulcers that must be recognized in addition.

**A Venous Ulcer\*** arises as a result of increased venous hydrostatic pressure, which causes local oedema, with its low exchange of oxygen and metabolites. Oedematous tissue, especially skin, is more vulnerable to trauma than healthy tissue, and is far less able to combat infection. As a rule, venous ulcers either coexist with incompetent superficial (varicose) veins, or with incompetent perforating veins (i.e., anastomotic veins piercing the deep fascia and linking the superficial with the deep veins) and are accurately termed 'varicose'. A very small percentage of venous ulcers develop without superficial varicosities and are due to deep-vein thrombosis (post-thrombotic ulcer).

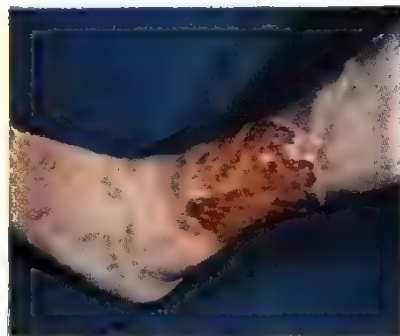


Fig. 905.—Venous ulcer with 'feeding' vein seen above.

**A Varicose Ulcer** (see Fig. 85, p. 38) is shallow, never penetrates the deep fascia, and has irregularly shaped shelving edges, which are often characterized by a thin, blue line of growing epithelium. The base of the ulcer can be formed of (a) pink granulations, (b) pale granulations, (c) slough. The size is variable and in long-standing instances the ulcer may encircle the limb. Often one or more large feeding veins can be seen proceeding towards the edge of the ulcer (Fig. 905); when the surrounding skin is scarred, feeding veins are not visible, but by digital palpation sometimes the presence of such a vein can be detected as a soft furrow in the area of induration. The site of a varicose ulcer is remarkably constant; it is situated on the lower leg, viz.

and is more commonly on the medial side (long saphenous vein) than on the lateral aspect of the leg (short saphenous vein); indeed, a considerable proportion lie above and behind the medial malleolus. If the ulcer is *not* situated in the region illustrated above it is improbable that it is venous in origin. Most varicose ulcers are painless. Considerable infection and involvement of the saphenous nerve in scar tissue are the causes of a painful varicose ulcer (Rose).



*The precursor of a varicose ulcer* is a splay of fine venules that courses from the medial (sometimes the lateral) malleolus, and spreads out to be lost beneath the thick skin of the heel. Such an aggregation is known as the 'flare sign'.

*Dermatitis* is another precursor of ulceration. The commonly used term 'eczema' is incorrect as it is not a sensitivity reaction. The skin is scaly and inflamed with intense itching a subjective feature.

*Pigmentation* is a sign of venous stasis of long standing in the area in question. It is due to increasing intracapillary pressure, which results in diapedesis of red blood-corpuscles. Having passed through the walls of the anoxic capillaries, the corpuscles disintegrate and their contained haemoglobin is converted into haemosiderin, which stains tissues brown. Considerable pigmentation can be present in

\* So named by John Gay in 1867. An alternative name is *gravitational ulcer*.

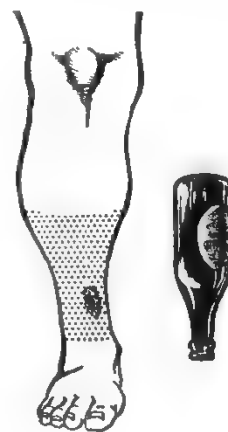
cases of varicose veins without ulceration, but as a rule an ulcer or ulcers (*Fig. 906*) of long standing, or the scar or scars thereof, are present.

*Equinus deformity* (*see Fig. 922 D*, p. 551) is occasionally seen after years of persistent varicose ulceration. It is the result of long-continued walking on the ball of the foot to relieve the pain caused in the region of the ulcer by full dorsiflexion of the ankle-joint.



*Fig. 906.*—Profound pigmentation in a case of venous ulcer of many years' duration.

**Post-thrombotic Ulcer.** In contrast to a varicose ulcer, *pain is a fairly constant accompaniment of a post-thrombotic ulcer*. The common site is similar and, indeed, the ulcer differs in no way from the description given for varicose ulcer. Often there is a clear history of venous thrombosis following childbirth, an abdominal operation, or an accident to the leg, but if not examine the abdomen. Should the abdominal wall, which for this purpose includes the inguinal and the femoral regions, bear a scar, endeavour to obtain evidence of post operative venous thrombosis. 'Bursting' pain in the limb (*see p. 407*) may be complained of if the deep veins are blocked. Varicose veins are lacking in spite of a very careful search, particularly of the areas where perforating veins are usually found (*see Fig. 702*, p. 403). A sign frequently present in an ulcerated leg, the seat of deep thrombosis, is extensive induration. The skin is firm, and seems to be tethered to underlying structures. Such induration often extends half-way up the calf, producing a peculiar, but characteristic, shape of the leg, viz. → which has been likened to an inverted beer-bottle.



**Carcinoma Secondary to a Venous Ulcer\*.**—In a few neglected cases of venous ulcer, or for that matter almost any ulcer of the leg, carcinoma develops, in which event too often the diagnosis is written on the face of the ulcer (*Fig. 907*). It should be the routine to examine the groin for enlarged lymph-nodes. Often lymphadenitis is present, but if one or more nodes are stony hard or the ulcer has a suspicious everted edge in any part of its circumference a biopsy is essential.

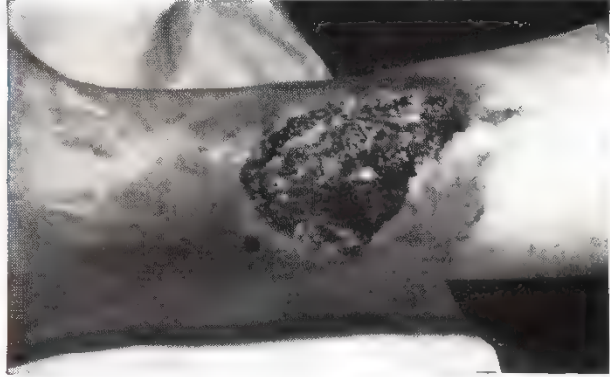
\* Marjolin described a carcinomatous ulcer occurring in scar tissue following burns; the term 'Marjolin's ulcer' is inaccurate when applied to this type of ulcer.



**An Arterial Ulcer** is rare when compared with the common venous ulcer. The essential difference is that the former is extremely painful. Varicose veins are likely to be absent, but their presence does not necessarily exclude the diagnosis. Men and women, usually over 60 years of age, are affected equally. The ulcer occurs most commonly in an area exposed to trauma (e.g., the shin; the lateral malleolus). The ulcer is deep (*Fig. 908*); not only does it penetrate the deep fascia, but not uncommonly tendons are exposed in its base because a comparatively large artery



*Fig 907.*—Carcinoma arising in a venous ulcer of many years' standing.



*Fig. 908.*—Arterial ulcer. The white speck in the centre is the exposed tendon.

has become occluded. The pulsations of the pedal arteries are absent, and the feet are cold. Often there is a history of intermittent claudication and sometimes discoloration of one or more toes is present, in which event the onset of gangrene is imminent.

**Congenital Arteriovenous Fistula** (*see p. 407*) is a rare cause of an ulcerated leg. As a rule an ulcer consequent upon an arteriovenous fistula appears at an unusually early age.

**Ulcer associated with Erythrocyanosis Frigida.**—This is seen exclusively in women, mostly young, living in Northern climes. As a rule the patient has plump legs and thick ankles. In even moderately cold weather the skin of the legs is bluish-pink, and in really cold weather blue mottling is strikingly evident. On warming, the skin becomes bright red and painful. When examining the patient on a cold day before she has had sufficient time to warm up, the skin of the legs feels unduly cold. If there is no evidence of them on the feet or hands, inquiry will disclose that the patient is much troubled by chilblains. Continuing superficial palpation of the legs, often the examiner will encounter small, superficial, painful nodules; these are areas of fat necrosis in the subcutis which are wont to break down to form ulcers (Bazin's disease). Usually such ulcers are small, and not solitary (*Fig. 909*). In warm weather the mottled blueness of the skin is not in evidence, but the swelling of the ankles becomes a little worse because of superadded oedema.

**An Ulcer occurring on a Paralysed Leg** is, in almost every instance, due to erythrocyanosis frigida secondary to the paralysis, the origin of which is frequently anterior poliomyelitis. The prelude to the ulcer is identical with the above in so far as undue susceptibility of the limb to cold is concerned, but the resulting ulcer (or ulcers) is very indolent.

**Leg Ulcer complicating Blood Diseases.**—Ulcer of the leg is common in sickle-cell anaemia. It also occurs, too frequently to be coincidental, in acholuric jaundice, Mediterranean anaemia, and Felty's syndrome. As an outcome of this

knowledge, it should be a routine procedure to examine the spleen for enlargement (*see* p. 242) when the cause of the ulcer is not perfectly clear.

**Artefact Ulcer** (Factitious Ulcer; Automutilation Ulcer).—A self-induced ulcer of the leg, which is not exceedingly rare, is encountered either in a highly neurotic



*Fig. 909.*—Ulcers associated with erythrocyanosis frigida. Occasionally there is a single large ulcer low on the back of the calf.

individual or in a litigant desirous of obtaining compensation. The mode of producing the ulcer varies. The ulcer is always in an accessible place, often on the anterior or the lateral surface of the leg. Possibly the diagnosis is suggested by the unusual shape or an unusual, or even an artificial, appearance of the ulcer; commonly the ulcerated surface looks so pink, clean, and healthy that the clinician is amazed that under treatment it remains stationary, or even increases in dimensions. If the ulcer is covered with a light plaster cast so that the underlying wound cannot be tampered with, a suspicion that the ulcer is factitious can be substantiated, for in these circumstances it will heal with great rapidity. In solving this problem signs that suggest a neurosis (*see* p. 50) can prove extremely valuable.

**Gummatous Ulcer.**—*See* p. 39.

**Footballer's Ulcer** (Traumatic Ulcer).—As its name implies, this occurs directly over the shin in otherwise healthy males. Improperly cared for, it becomes indolent and adherent to the bone. This ulcer follows knocks on the shin from any cause, but is often acquired at football.

**Meleney's Synergistic Ulcer.**—This was originally described in relation to infected abdominal and thoracic operation wounds which are still its commonest situations (*see* p. 34). However, the sybiotic infection may occur on the leg (or in the hand) arising either *de novo* (particularly in ulcerative colitis) or, more usually, as a complication of a previously existing ulcer, which, on the law of averages, is usually varicose, at least in temperate climates. The onset is very rapid, and the most important clinical characteristic is burrowing, which may extend 2 cm. or even more beneath apparently healthy skin; the margins therefore are always extensively undermined. The ulcer is painful and tender and shows a tendency to spread ever wider in an alarming fashion.



*Fig. 910.*—Ulcers associated with rheumatoid arthritis.



**Leg Ulcer in Rheumatoid Arthritis.**—This is peculiar to patients with severe, crippling arthritis and occurs among those 20 per cent in whom subcutaneous nodules are plentiful (Allison). This seems to suggest that it is due to breakdown of a nodule. The ulcer (sometimes more than one is present) varies in size, is punched-out, shallow (its floor being formed of subcutaneous tissue), and clean. As a rule, it is without surrounding oedema or palpable induration, but is encircled by a dark-red flush, is situated on the medial (Fig. 910) or the lateral surface of the lower third of the leg, and is painful and slow to heal.

**Leg Ulcer associated with Osteitis Deformans.**—As both Paget's disease of bone (see p. 435) and venous ulcer are common conditions, often the ulcer is a coincidental venous ulcer. On the other hand, a small, deep ulcer situated right over the convexity of the anteriorly bowed tibia strongly suggests that the ulcer is an example of this clinical entity. The base of the ulcer is bone, to which the edges are densely adherent. Consequently it is extremely resistant to treatment.

### LEG ULCERS IN THE TROPICS

Those best qualified to know recognize three varieties of leg ulcer specific to the tropics and subtropics. To distinguish them with certainty, and thus to cure them, the organisms they harbour must be isolated.

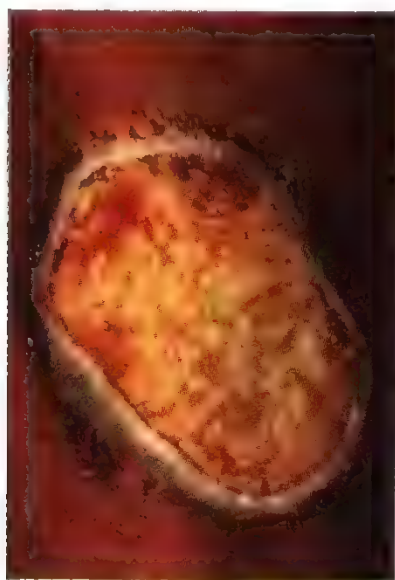


Fig. 911.—Tropical ulcer. The patient was an Indian boy of 14 years of age. He sustained a very small puncture wound on the lateral aspect of the left leg two months previously. For one month the resulting ulcer has remained stationary in size, 6 × 4 cm. Note the raised edge.



Fig. 912.—Diphtheritic desert sore. The purulent exudate covering the ulcers was cleaned away before the photograph was taken.

**Yaws.**—The primary sore sometimes is found on the leg or foot (but more often on the buttocks of young children before they walk) as an infected abrasion in which the causative *Treponema pertenue* can be found. It heals in a few weeks. In the tertiary stage multiple deep ulcers, which also contain the spirochaete, are present. They are painless and in the course of healing form tissue-paper-like scars.

**Tropical Ulcer** occurs in the monsoon-ridden humid zone of the tropics, where it is endemic, but breaks out in seasonal epidemics. Sporadic cases occur far out in the subtropics, where the condition is often misdiagnosed, usually as a venous ulcer.

The infection develops in a breach of continuity of the skin due to trauma or an insect bite: it occurs practically exclusively in the lower leg and foot in those who go about bare-legged. The

ulcer is due to infection by Vincent's organisms\* which, together with many other pyogenic bacteria, are always present in the discharge. It commences as a papulo-pustule which in a matter of hours becomes surrounded by a zone of angry inflammation with induration. Should the patient seek advice at this time, he does so because of the accompanying painful, tender lymphadenitis. In two or three days the pustule bursts and by a process of necrobiosis an ulcer forms and extends rapidly. Its interior is brown, *its edges are undermined*, a zone of skin in the immediate vicinity is infiltrated and raised. There is a copious serosanguineous discharge and considerable pain. In most cases, after a few weeks the spreading ceases (*Fig. 911*) and then the ulcer remains practically the same size for months, sometimes even for a year or two. In other cases the ulcer assumes phagedenic† characteristics; it can then become of such dimensions with so great a destruction of soft parts of the leg and foot as to call for amputation. In its more usual indolent course it must be distinguished chiefly from yaws. However, at any stage of either course, the profuse serosanguineous discharge, the overpowering vile odour, the unremitting constant pain, the comparatively slight constitutional symptoms, and the extreme tenacity of the contained slough should make the diagnosis very easy. On healing, a tropical ulcer leaves a permanent scar which is characteristically circular, parchment-like, and faintly pigmented. Occasionally squamous carcinoma supervenes.

**Diphtheritic Desert Sore,**‡ as its name implies, is peculiar to the hot, parched desert wastes of the world, in all of which it is fairly common. The lesion is due to a true diphtheritic infection by the *Corynebacterium diphtheriae*. The disease commences as a papulo-pustule. Within a few days the top of the papule becomes necrotic, and an ulcer forms. This slowly enlarges, until it attains a diameter of 1–2 cm. At times the floor of the ulcer is covered by typical *diphtheritic membrane*, which is removed with difficulty, but the presence of this slough is uncommon (Castellani). The ulcer (*Fig. 912*) runs a chronic course, and not rarely the patient shows signs of peripheral neuritis due to the toxin produced by the diphtheria bacillus.



*Fig. 913.*—Method of holding the foot while the movements of the ankle-joint are tested. It is of fundamental importance to grasp the *midfoot*, and not the forefoot. Normal extension (dorsiflexion) reaches 20°, flexion (plantarflexion) 50°.

\* *Fusiformis fusiformis* and the spirochaete *Borrelia vincentii*.

† *Phagedena*. Greek, *phagein* = to eat.

‡ Known in South Africa as 'Veldt sore' and in Australia as 'Barcoo rot'.

## THE ANKLE-JOINT

**Bony Landmarks.**—The two malleoli are among the most obvious surface markings in the body. The lateral is a little less prominent, and descends lower than the medial malleolus, the tip being 1 cm. below and behind the corresponding landmark on the medial side. The line of the ankle-joint lies on a plane 1 cm. above the tip of the medial malleolus.

**Effusion into the Ankle-joint.**—When the joint becomes distended with fluid the foot takes up a position of inversion and slight dorsiflexion. That an excessive amount of fluid is present is first indicated by a bulging beneath the extensor tendons as they cross the joint-line and a fullness just anterior to the lateral and medial malleolar ligaments. More extensive effusion causes bulging posteriorly, and filling up of the hollow on either side of the tendo Achillis. To confirm the presence of fluid, place a finger on either side of the tendon. By digital compression, some of the fluid can be displaced from one side of the tendon to rebound against the watching finger on the contralateral side. For reasons stated on p. 11, it is incorrect to state that this constitutes fluctuation.

**Testing Movements of the Ankle-joint.**—The Neutral Position is with the foot at a right-angle to the leg. The heel is grasped in the left hand, and the midfoot in the right (*Fig. 913*). If the forefoot is held, movement at the subtaloid and midtarsal joints will vitiate the findings.

Usually the ankle-joint has two movements only—flexion and extension. A few individuals are possessed of a lax lateral malleolar ligament, which allows some lateral movement of the talus within the tibiofibular mortise (Bonnin). The variant is bilateral so that, with painful injury, it can be tested for on the sound side. Patients with hypermobile ankles are prone to recurrent inversion sprains.

**Ligamentous Injuries without Fracture** ('Sprained'\* Ankle).—As in other situations, these may be incomplete or complete.

*Rupture of the Anterolateral Portion of the Capsule*, and (sometimes) the anterior fasciculus of the lateral malleolar ligament as well, is the most common cause of a sprained ankle. It is the result of a combined inversion and plantar flexion accident. Pain and tenderness are localized to the front of the ankle towards the fibular side (*Fig. 914*). Directly after the accident a haematoma appears in this situation, but it soon becomes obscured by oedema.

*Rupture of the Middle Band of the Lateral Malleolar Ligament* (Inversion Sprain).—Maximum tenderness is found below and anterior to the tip of the malleolus, in contrast to a Pott's fracture-dislocation, where the tenderness is over the fibula itself. The tenderness is due to concomitant damage to the fibres of the anterior capsule of the joint, and oft-times tenderness in this situation is more pronounced than over the middle band of the collateral ligament (*Fig. 914*) because the former fibres are nearer the surface. It is important to be able to distinguish a complete tear of the ligament from an incomplete tear or a 'sprain'. In every relevant case the following test should be carried out, otherwise avulsion of the ligament from the fibula is liable to be overlooked. The ankle is passively inverted—a manipulation which, if carried out slowly, does not cause much pain, but if it

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\* 'Sprain' is an ambiguous term, often used to imply that no fracture has been sustained. It should be reserved for tearing of a few fibres of a ligament. If the injury is more severe, it is advisable to employ the terms 'incomplete rupture' or 'complete rupture' of the ligament.

does local anaesthetic should be injected before attempting it again. If the ligament is avulsed, an obvious gap appears between the tip of the malleolus and the talus on the anterolateral aspect of the joint. In doubtful cases the findings can be confirmed by a radiograph taken while the examiner holds the ankle in full inversion (Watson-Jones).



*Fig. 914.*—The anterior spot (A) is the most common site of tenderness in sprained ankle. When the middle band of the lateral malleolar ligament is torn, there is, as a rule, tenderness over (B) also.

**Rupture of the Medial Malleolar Ligament.**—As this is much the strongest ligament of the ankle-joint, it is unlikely to be torn unless there is a fracture of the lateral malleolus and a subluxation of the ankle-joint (Pott's fracture).

**Pott's Fracture-subluxation**, easily the most important fracture in the region of the ankle-joint, is a break of the lower end of the fibula, usually about 5 cm. above the tip of the malleolus with, often, fracture of the tip of the medial malleolus. In almost every case there is some lateral or medial displacement of the talus (*second-degree fracture*), and in many instances there is backward displacement of the talus, too (*third-degree fracture*). For these reasons there is ample justification for designating this fracture a fracture-subluxation\* but the displacement of the talus is insufficient to warrant the term 'dislocation'.

In children and adolescents similar displacements of the lower tibial epiphysis occur.

A patient who has sustained this injury can neither walk nor stand upon that leg; soon the ankle becomes swollen and bruised. On examination it will be found that he cannot move the ankle-joint. When compared with that of the opposite side, the distance between the tips of the malleoli is seen to be increased except when there is no bone displacement (*first-degree fracture*). Having ascertained by the principles enunciated in Chapter XXIX that a fracture is present in this situation, always observe the heel from the lateral aspect for backward displacement signifying a third-degree fracture. Needless to say, in ordinary circumstances, X-rays are essential for completely accurate diagnosis and reduction of all ankle fractures.

The following two fractures are best regarded as unusual types of Pott's fracture.

**Dupuytren's Fracture.**—When a fracture is sustained by falling from a height on to the feet, the talus is driven upwards and the ligaments which support the inferior tibiofibular joint are

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\* Subluxation: the joint surfaces are displaced but there is some contact between them.

torn asunder (*diastasis*). The whole foot is displaced upwards, the width of the ankle between the malleoli being greatly increased, and the distance from the malleoli to the sole shortened.

**Maisonneuve's Fracture.**—A rare variant. If, on X-raying a case of presumed Pott's fracture, *displacement* of the medial malleolus only is found, re-examine the region of the neck of the fibula. Tenderness due to a spiral fracture is probably present, which, together with the malleolar fracture and slight diastasis, constitutes this entity.

**Arthritis.**—In the case of the ankle-joint it will be unnecessary to consider all the usual forms of arthritis, for their features in general do not differ sufficiently from those of arthritis of other major joints to warrant further description. There are, however, a few forms of arthritis of the ankle-joint that merit special attention.

Attention is drawn here to the fact that an *early* effusion into the ankle-joint is difficult to detect. View the joint from behind; in the presence of a small amount of fluid the normal fossae behind the malleoli X are filled when compared with the normal side. —————→



**Traumatic Arthritis** results from repeated minor traumata especially those sustained at football. Should the patient, as is often the case, first be seen with a swollen joint, often there is some difficulty in distinguishing the condition from tuberculosis. In traumatic arthritis there is no radiographic evidence of bone rarefaction, and when the effusion has subsided tiny osteophytes can often be felt in the joint line.



Fig. 915.—Tuberculous ankle-joint.

**Tuberculosis of the Ankle-joint.**—The leading early signs are that the ankle is swollen (Fig. 915) and the calf is wasted more than one would expect from disuse atrophy, a useful point in distinguishing from traumatic arthritis. A limp is inevitable, and there is pain in the joint. It is not long before the patient walks on the fore-foot to prevent painful weight-bearing on the heel. A sinus develops in most untreated cases.

#### **Lesions of Soft Tissues peculiar to this Region.**—

**Tailor's Ankle (Tailor's Bursa).**—Over the subcutaneous area of the upper part of the lateral surface of the lateral malleolus a sizeable adventitious bursa is wont to appear in old-time tailors or others who work while sitting cross-legged.

**Recurrent Dislocation of the Peroneal Tendons** from their groove occurs occasionally. One or both tendons slip anteriorly over the lateral malleolus owing to laxity of their restraining



ligaments. The condition occurs on active extension with eversion and is sometimes very painful; at others the patient can demonstrate the dislocation, with an audible click, so that diagnosis is obvious. Otherwise, unless the patient is seen during an attack, it must be surmised from the history.

**Chronic Stenosing Tenosynovitis of the Peroneal Tendon-sheath**, similar to that found about the wrist (*see* p. 474), occurs rarely. Tenderness and swelling are found in the course of these tendons below and behind the lateral malleolus. Pain occurs only on inversion of the foot (Gunn).

**Swollen Ankle(s).**—Unilateral or bilateral puffiness around the ankle is a problem which frequently confronts the general practitioner. In bilateral cases it is essential to exclude a systemic cause—cardiac or renal insufficiency; endocrine disease (*see* p. 11). These having been eliminated, the back as well as the front of the whole of the lower limbs should be inspected and palpated for varicosities. Next, oedema of lymphatic origin (*see* p. 408) must be considered. Foot strain is a cause of slight swelling of the ankles in some heavy individuals.

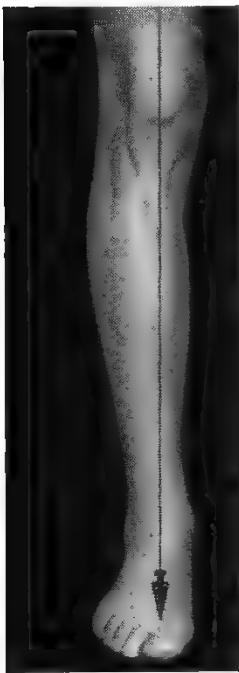
*Unilateral Oedema* of the ankles is a frequent accompaniment of a recent bony or ligamentous injury. Not infrequently the swelling persists for months, in which event an original sprain may have been forgotten. Homans stressed that many cases of oedema following a sprain or a fracture are, in fact, instances of thrombophlebitis. Others believe that such swelling is due to Sudeck's osteoporosis resulting from the injury. It must be conceded that after considering all these possibilities there remain a few cases which defy explanation.

## CHAPTER XXXVI

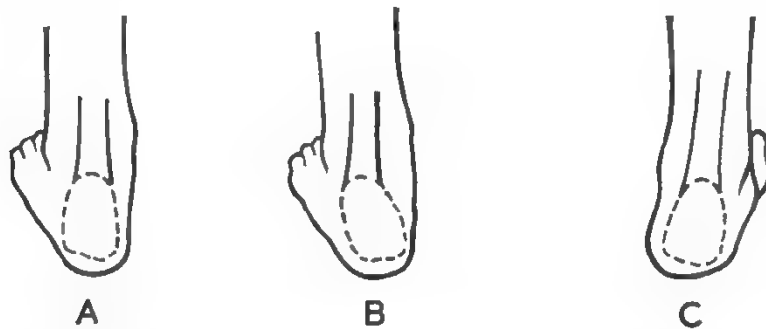
## THE FOOT

**Examination of the Feet.**—This varies widely with the complaint. Thus the examination of a case of talipes equinovarus presenting at birth (*see* p. 551) differs entirely from that of an adult with an in-growing big toe-nail (*see* p. 560). In all patients other than infants the following basic routine is advised: the lower limbs should be exposed at least to the mid-thighs and the gait (*see* p. 449) is observed. If pain is the complaint, unless there is an obvious lesion the patient is asked to point to its site.

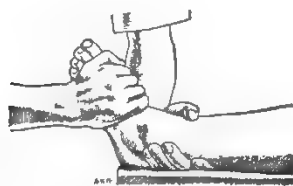
*The Arches of the Foot.*—The longitudinal arch (*see* p. 553) and the transverse arch (*see* p. 555) are next scrutinized for evidence of flattening, the patient standing



*Fig. 916.*—Normally a plumb line dropped from the midline of the patella passes to the interval between metatarsals I and II. The heel is aligned with the midline of the tibia posteriorly. These two criteria comprise the Neutral Position of the foot.



*Fig. 917.*—A, The normal heel viewed from the back. B, In talipes equinovarus the calcaneus is tilted outwards. C, In marked flat-foot it is tilted inwards.



*Fig. 918.*—Inversion.



*Fig. 919.*—Eversion.

in front of the clinician, preferably on a raised platform, with the feet parallel and slightly apart. In a properly balanced foot, an imaginary plumb line dropped from the middle of the patella should strike the interval between the first and second metatarsal bones (*Fig. 916*).

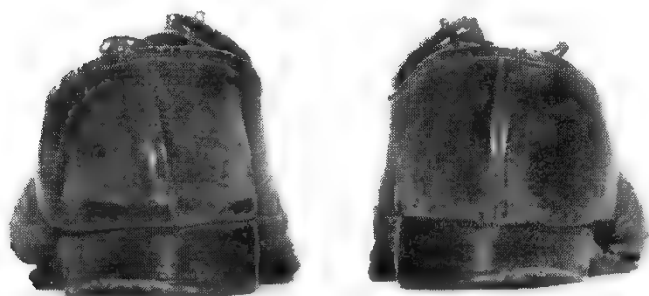
*The Heel.*—Next, the patient is asked to turn round, with the calves exposed and any shortening of the tendo Achillis or tilting of the calcaneus noted. Normally there is a slight medial tilt (eversion) and in long-standing flat-foot this may be marked (*Fig. 917 A, B*). In uncorrected or partially corrected talipes equinovarus (*see* p. 551) there is a lateral tilt of the calcaneus (inversion) (*Fig. 917 C*).

*Testing Movements of the Foot.*—Lastly the patient lies on a couch, and with

the knee extended, the foot should be put through its movements (*Figs. 918, 919*). Note that flexion and extension take place mainly at the ankle-joint (*see p. 545*).

Further methods of examination are detailed in the rest of this chapter.

*Scrutinizing the Patient's Footwear.*—Unless the patient's shoes are new or have been repaired recently, information can be gleaned therefrom. That part of the sole and/or heel subject to undue pressure in walking is seen to be very worn down. The normal foot tends to wear the outer sides of the heels (*Fig. 920*).



*Fig. 920.*—Wearing down of the outer side of the heels, after some months of use, of shoes by a person with normal feet.

### TALIPES\* (CLUB-FOOT†)

Deformities of the foot are, by convention, named according to the position of the foot. For this purpose the four cardinal positions are called (1) Equinus = flexion; (2) Calcaneus = extension; (3) Varus = inversion; (4) Valgus =



*Fig. 921.*—In the newborn infant the little toe can be placed on the shin easily.

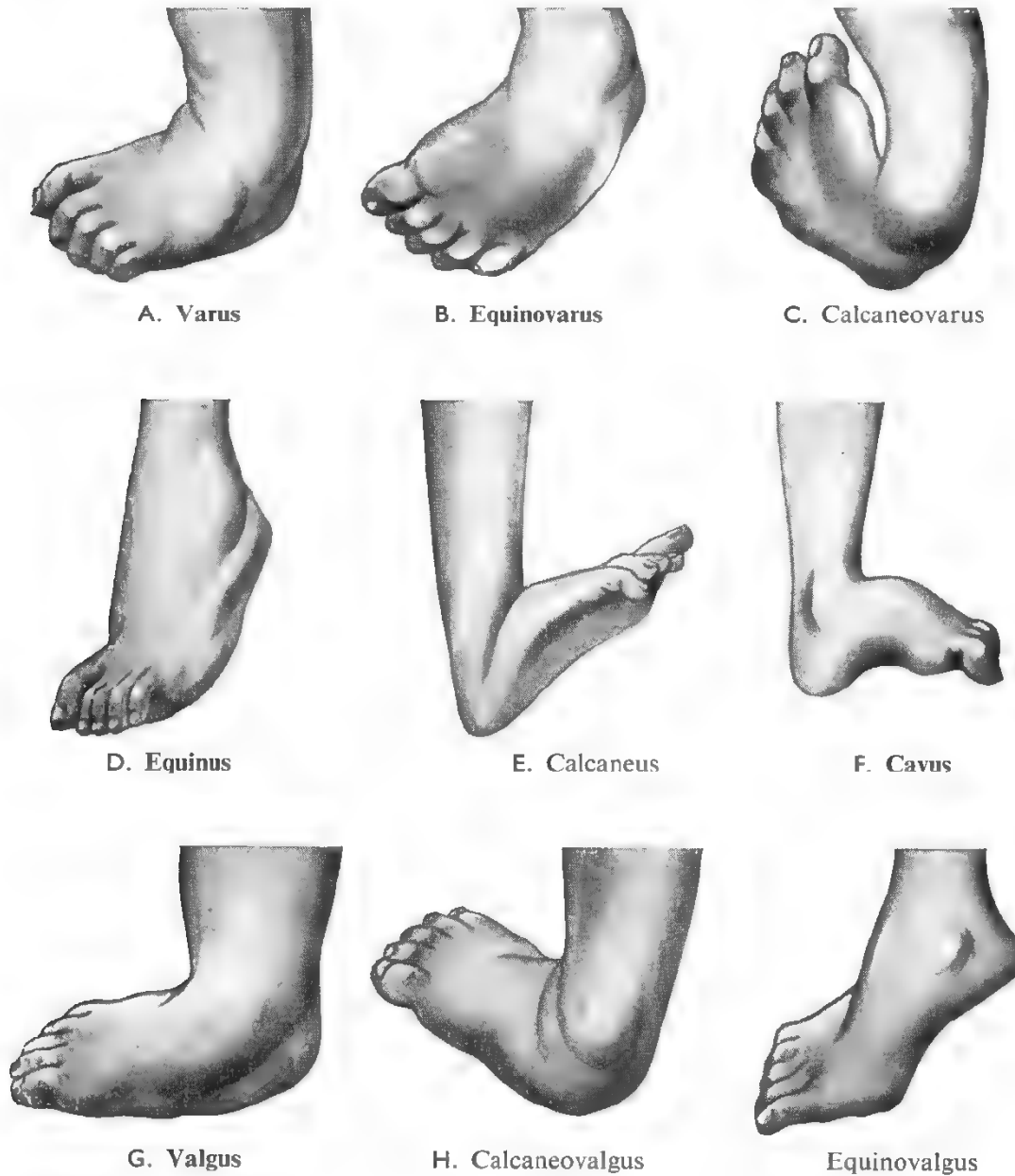
eversion. To these are added Cavus = an undue hollowing of the instep. These five names, and combinations of any two of them, are all that is necessary to put

\* *Talipes*. Latin, *talus* = ankle + *pes* = a foot. Original meaning: a deformity that causes the patient to walk on the ankle. Present-day meaning: any variety of club-foot.

† *Club-foot*. Severe untreated *talipes equinovarus* has a club-like appearance.

the deformities illustrated in *Fig. 922* into words. Unless the student masters this, he will swell the number of those who throughout their careers remain ignorant of deformities of the foot.

**Talipes Equinovarus** (*Fig. 922 B*).—By far the most common of these deformities is congenital talipes equinovarus (probably due to a cramped position in utero). Boys are affected twice as often as girls, and the deformity is bilateral in one-third of cases.



*Fig. 922.*—Varieties of talipes. The commoner varieties are captioned in **bold** type.

In a normal baby it is not unusual for the feet to repose in an equinovarus position ('in-toeing' or inversion spasm); each foot, however, can be passively extended until the toes touch the anterior aspect of the leg (*Fig. 921*). In talipes equinovarus the deformity strongly resists correction. Furthermore, furrows are formed at the flexures of the foot, the tendo Achillis is short and stands out like

a cord when extension is attempted, and the calf muscles are underdeveloped. **Calcaneovarus** (Fig. 922 C) is a rare extremely severe degree of equinovarus.

**Talipes Equinus\*** (Fig. 922 D) is about half as common as talipes equinovarus. It should be noted that talipes equinus is always an acquired condition, due either to paralysis of the extensors of the foot or to shortening of one leg necessitating

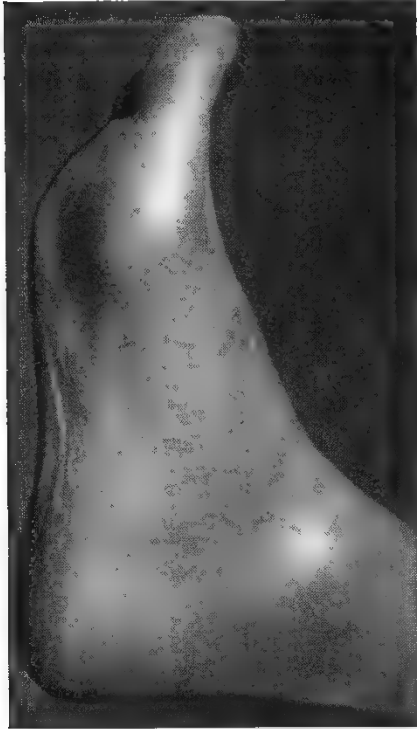


Fig. 923.—Contracture of the plantar fascia.

continued walking on tip-toe. In women who habitually wear high-heeled shoes a minor degree is often present and it is also seen with long-standing varicose ulceration. When examining patients with this condition *the knee should be extended*, as the flexed knee relaxes the tendo Achillis and minimizes the deformity. Callosities may be found beneath the heads of the metatarsal bones.

**Metatarsus Varus.†**—The forefoot is medially deviated but the foot is plantigrade (Fig. 922 A). This is an occasional congenital anomaly which does not, in later life, cause a serious deformity. If untreated, the person walks with markedly in-turned feet ('pigeon toes').

**Pes Cavus†** (Fig. 922 F) is not uncommon. The toes are clawed and callosities form over the metatarsal heads as in splayfoot (see p. 555). Probably the congenital form is due to shortness of plantar fascia but some cases result from brain disease (*Friedreich's ataxia*). The acquired form can be due to paralysis of the small muscles of the foot due to a lesion of the posterior tibial nerve, but where there

is no evidence of a nerve lesion pes cavus may be due to.—

**Contracture of the Plantar Fascia.**—A small percentage of patients suffering from Dupuytren's contracture (see p. 491) have also some degree of contracture of the plantar fascia. As a rule this contracture is unilateral (Fig. 923) and asymptomatic.

**Pes Valgus†** is the congenital variety of flat-foot. The foot is plantigrade but the longitudinal arch is defective (Fig. 922 G). The cause is vertical talus (see p. 553).

**Talipes Calcaneovalgus**, with lengthening of the tendo Achillis, is an uncommon form of congenital talipes (Fig. 922 H). Vertical talus is present and the condition can be regarded as a more severe form of the foregoing. Sometimes it is associated with dislocated hip or hyperextension of the knee.

**Talipes Calcaneus** (Fig. 922 E) is an inevitable deformity in cases of isolated paralysis of the gastrocnemius and soleus muscles.

**Talipes Equinovalgus** (Fig. 922 I) is rare, and almost always acquired.

**Completing a Diagnosis of Talipes.**—Having made a diagnosis of talipes, and having decided which variety is present, it is necessary to state whether the deformity is congenital or acquired. Although obviously this is not difficult if the patient is an infant, it is always necessary to look for other congenital deformities, notably one of the varieties of spina bifida (see p. 204).

\* *Equinus*. Latin, *equinus* = equine; horse-like. In this instance, like a horse's hoof.

† These are usually not classified as talipes as the foot is plantigrade.

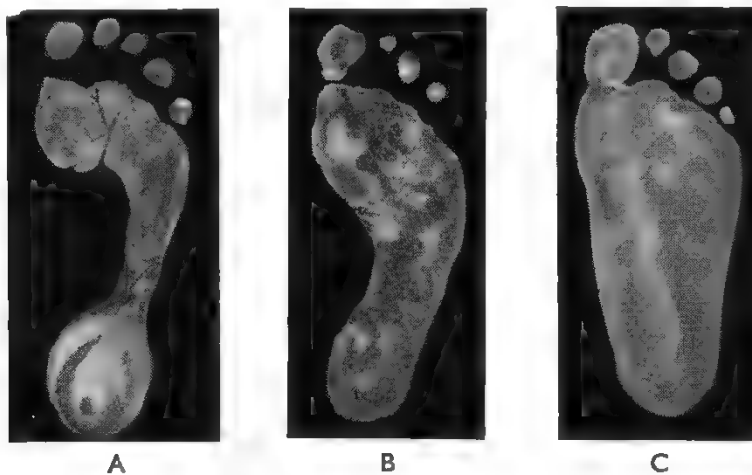


In older children and adults, when the leg is cold, perhaps even livid, and one or more groups of activating muscles are wasted and the patient is unable to move the foot and the toes in all the usual directions, the talipes is certainly paralytic—most commonly a sequel to anterior poliomyelitis.

## THE SOLE

### FLAT-FOOT

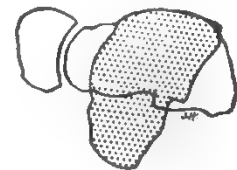
**Pes Planus** is one of the most common defects of the feet. The causes of the condition are heterogeneous, and in most instances the condition is bilateral. Flattening of the *longitudinal arch* will be considered first (*Fig. 924*).



*Fig. 924.*—Footprints. A, Normal; B, Early flat-foot; C, Advanced flat-foot.  
(After De Quervain.)

1. *The Pseudo-flat-foot of Infants.*—In infants the flat appearance of the feet is normal, and it persists for a variable time after the child has commenced to walk. It is due to a subcutaneous fat-pad that obliterates the arch and may remain up to the age of 3 years.

2. *Congenital Flat-foot due to Talonavicular Dislocation* is rare. The infant is born with the talus dislocated so that its anterior surface is rotated towards the plantar surface (vertical talus), viz. ———→  
Usually the dislocation is unilateral. The dislocated head of the bone can be felt beneath the medial and central part of the sole.



3. *Rotation of the Limb.*—As a result of either a congenital abnormality or one acquired very early in life, the entire limb is rotated laterally (anteversion of the femoral neck); alternatively the rotation is confined to the leg below the knee (tibial torsion). In either the patient stands like Charlie Chaplin (*Fig. 925*), and the line of the body-weight, falling too far medially, throws undue strain upon the longitudinal arch, which consequently drops.

4. *Genu Valgum* (see p. 534) also causes the body-weight to be diverted too far medially, with the same result. It is a common cause of flat-foot in children.

Next consider the causes in adolescence or adult life. At an early stage of the

examination it is imperative to decide whether the flattening of the longitudinal arch is constantly present (rigid flat-foot) or if the foot assumes an arch when weight-bearing is removed.

Observe the arches with the patient standing and ask him to try to arch the inner border of the foot (*Fig. 926*).

*Examination with the Patient Reclining.*—Put each foot through its movements (*see Figs. 918, 919*) and note whether the arch has returned partially or wholly when the body-weight has been taken off it.



*Fig. 925.*—A, Flat-foot and 'Charlie Chaplin' stance due to anteversion of the femoral neck; B, When the patient is asked to stand straight the patellae signify that the limbs are rotated medially. Note the apparent bow-leg.



*Fig. 926.*—Rigid flat-foot: A, Bearing normal body-weight; B, Attempted inversion.

**Relaxed Flat-foot.**—A relaxed flat-foot assumes an arch when weight-bearing is removed. This is the most common variety of flat-foot, and it is encountered most frequently in young adults, but it often occurs in middle life, particularly if the patient is called upon to undertake much unaccustomed standing or he or she puts on weight rapidly. Movements are full.

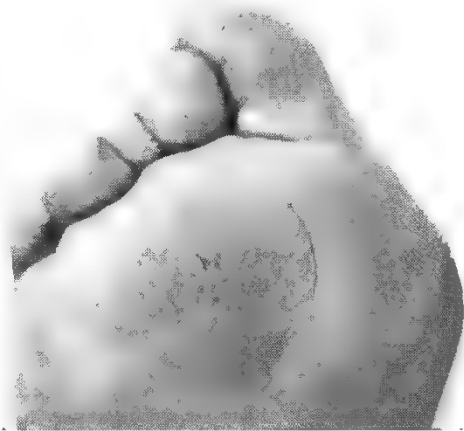
**'Foot Strain'** is a variety of the above. The patient, often after confinement to bed or unusual exercise, complains of pain over the longitudinal arch (*see Fig. 935*) where there is tenderness, and even oedema on occasion, but not necessarily flattening of the arch.

**Rigid Flat-foot** is seen principally in middle and late life and is often painless. It is due to fibrous, cartilaginous, or bony ankylosis, most commonly in the talocalcanean or talocuboid joints. Ankylosis can follow a severe or incompletely reduced Pott's fracture-subluxation, an injury involving one or more of the tarsal

joints, or it can be the result of acute or chronic arthritis of these joints. All foot movements are limited. In older patients remember to examine the foot pulses (*see* p. 389). Intermittent claudication may present with typical pain in the foot, even in the presence of flat-foot.

**Spasmodic Flat-foot.**—The peroneal muscles are contracted rigidly. When the condition, which occurs in adolescents (particularly boys), is suspected, the peronei should be palpated early in the course of the examination. *Inversion* alone is limited, because of spasm of the peronei muscles.

Fig. 927.—Callosity over the metatarsal heads which normally do not bear weight (second to fourth) in a patient with transverse flat-foot.



**Transverse Flat-foot (Splay Foot)**, which is common and frequently associated with hallux valgus, is due to flattening of the transverse arch of the forefoot (*Fig. 927*). When the symptoms are due to the fallen arch, as opposed to the hallux valgus, they are those of metatarsalgia (*see* p. 562).

#### CORNS AND CALLOSITIES AND THEIR DIFFERENTIAL DIAGNOSIS

**A Callosity** is an area of hard, greatly thickened skin that occurs as a protective measure when intermittent pressure is distributed over a comparatively large area. At the periphery, cornified skin ceases abruptly where it is continuous with normal skin. Callosities appear where the skin is normally thick, most frequently on the soles, beneath the heads of one or more of the metatarsal bones, around the heel, and on the inframedial side of the great toe but never on the dorsum although they may be seen on the outer border of the foot in uncorrected talipes equinovarus.

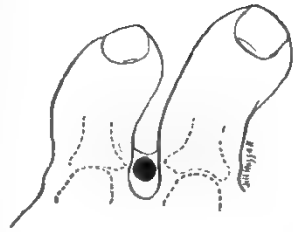


Fig. 928.—The most common situation of a corn. The central core—a highly distinctive feature—can be seen.

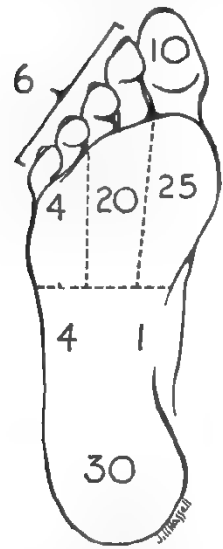
**A Hard Corn.**—When intermittent pressure occurs over a very limited area, a corn ensues. It consists of a conical wedge of highly compressed keratotic epithelial cells which impinges on the nerve-endings, hence the pain. It is characterized by a central core of white appearance composed of degenerate cells and cholesterol and is encircled by a narrow area of keratosis, which disappears gradually at the periphery. Palpation reveals the causative bony projection beneath the cutaneous lesion.

Corns occur chiefly where the normal skin is thin, and they are found particularly on the fifth toe (*Fig. 928*), and over the dorsal projections of hammer-toes.

A **Soft Corn** is soft because it occurs between the toes, where maceration takes place. The site of election of a soft corn is at the bottom of the cleft between the fourth and fifth toes where opposing prominent bony projections of the bases of the proximal phalanges give rise to pressure and friction. —————→ The great pressure to which these toes are subjected is shown by their prismatic shape, the apex of the prism being directed towards the intervening cleft. Soft corns are particularly painful and are often mistaken for a wart.

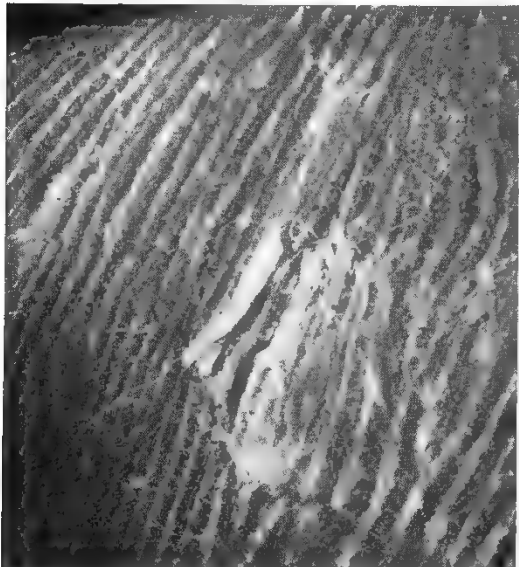


**Plantar Wart.**—As the treatment is completely different from that of a corn or a callosity, it is important to be able to diagnose a plantar wart (*Fig. 929*), which presents as a rather dark, obliquely set pearl in the skin, usually being situated on a weight-bearing portion of the sole or heel so that it soon becomes submerged and surrounded by a collar of cornified skin (Forman). Through the cornified skin can be seen red or black spots, which are haemorrhages from attenuated fronds of the submerged papilloma. These spots are recognized more easily through a magnifying glass (*Fig. 930 B*). A plantar wart is *exquisitely tender* when pressed towards the underlying bone. This is *the* distinguishing feature from a callosity. Mother warts and daughter warts may form a characteristic constellation found with warts in other situations.

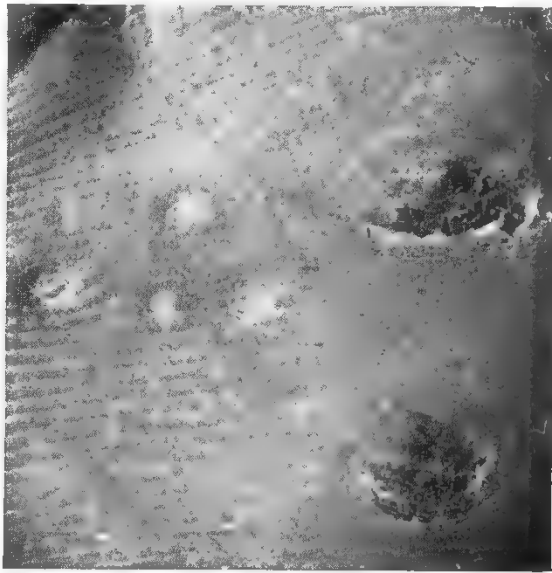


*Fig. 929.*—Percentage distribution of plantar warts averaged from various statistics.

**Perforating (Neurotrophic) Ulcer.**—The most common situation for a perforating ulcer is beneath one of the metatarsal heads, particularly the first and fifth. The next most common situation is beneath the tips of the terminal phalanges of the toes (*Fig. 931*). Ulcers over the metatarsal heads are always associated with thick callosities. *Tabes dorsalis* is now an uncommon cause of perforating ulcer of the foot: *spina bifida* and *diabetic neuropathy* (*see p. 423*) are frequent, but injury of the spinal cord or sciatic nerve accounts for some cases. The differential diagnostic sign between perforating ulcer



A



B

*Fig. 930.*—A, Callosity; B, Plantar wart, each as seen under a magnifying glass (× 8).

(or ulcers) of the toes and a pre-gangrenous appearance of the toes due to occlusive vascular disease is that in the former strong pedal pulses are present.

#### NEOPLASMS OF THE SOLE OF THE FOOT

Neoplasms of the foot do not differ from those developing elsewhere in skin and bone, but are relatively rare. Two growths, when they occur in the sole, show special characteristics.

**Malignant Melanoma.**—The most frequent site is in the soft skin of the instep, but melanoma can occur on the weight-bearing portion of the sole (*Fig. 932*). Unfortunately the lesion in its early stage is asymptomatic and unnoticed until ulceration occurs. When suspected the regional lymph-nodes (groin) and the liver must be palpated.

**Squamous Carcinoma of the Foot.**—In contradistinction to a melanoma, an epithelioma of the foot is almost always confined to the hard skin of the weight-bearing areas of the forefoot (*Fig. 933*). As a result of weight-bearing it soon infiltrates among the tendons and bones so that it is fixed to the deep structures at an early stage. There is no evidence that this neoplasm is the result of a malignant change in a callosity or a plantar wart.

#### THE HEEL

**Fracture of the Calcaneus** is a common accident in workmen who use ladders or steps. The fracture is due to a fall on to the feet from a height, and is bilateral, and often associated with a *fracture of the vertebral column* as well when the height of the fall is greater than the patient's height.



*Fig. 931.*—Distribution of neurotrophic ulcers. The most common situations are over the metatarsal heads and beneath the tips of the toes. (*After Coventry.*)



*Fig. 932.*—Ulcerating melanoma of the foot.



*Fig. 933.*—Carcinoma of the sole of the foot.

#### *Signs of Fractured Calcaneus:—*

1. There is broadening of the heel.
2. Normal hollows below the malleoli are obliterated.



3. Haemorrhage occurs into the sole, and it is not long before a bruise appears on the plantar aspect of the heel.

4. Maximum tenderness is situated posteriorly near the insertion of the tendo Achillis, rather than upon the plantar aspect.

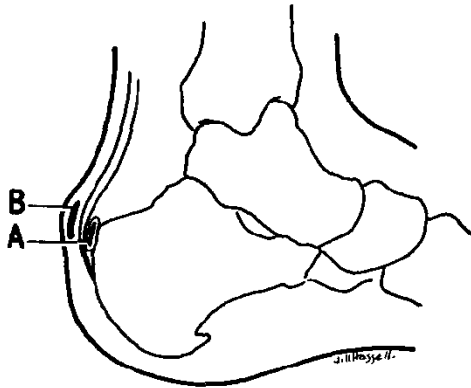


Fig. 934.—A, Retrocalcanean bursa;  
B, Retro-Achillis bursa.

5. Active and passive movements of the ankle are reduced to about half their normal excursion. In addition, inversion and eversion of the foot (subtaloid joint) are curtailed almost completely because of pain.

**Apophysitis of the Calcaneus (Sever's Disease)** occurs most often in boys of 10 to 12 years of age. Like Osgood-Schlatter's disease (*see* p. 528), the condition is a traction injury of the epiphysal cartilage. The first symptom is a limp, followed by dull pain in the back of the heel. There is tenderness localized to the posterior surface of the calcaneus *below* the insertion of the tendo Achillis; sometimes slight swelling in the region is present.

**Retrocalcanean Bursitis.**—There is a bursa situated between the tendo Achillis and the calcaneus (*Fig. 934 A*). Inflammation of this bursa gives rise to local pain and tenderness. When swelling is present in addition, it is situated *on either side of* the tendon.

**Retro-Achillis Bursitis.**—An adventitious bursa develops between the tendo Achillis just above its insertion and the skin (*Fig. 934 B*). Swelling of the bursa is seen readily: it is situated *over* the tendon, and not on either side of it.

These bursae are liable to become inflamed from friction of the tendo Achillis against the counter (the stiffener) of ill-fitting footwear. Young women who wear high heels are the chief sufferers, but the condition is met with also in Army recruits.

**Calcaneal Exostosis** is a not uncommon condition seen in adolescent girls. A bony protuberance is found on the posterior surface of the bone lateral to the insertion of the tendo Achillis.

Pain is caused by the shoe rubbing on the lump which is *not* the anatomical lateral tubercle which is situated on the inferior surface.

**Achillis Tendonitis.**—The tendon has no sheath so that pain, tenderness, and swelling are due to rupture of a few fibres of the tendon when the affected part is above the level of the shoe-line although Reiter's syndrome (*see* p. 449) is an occasional cause. On the other hand, with inflammation of one of the above bursae the signs are confined to soft tissues below that line.



**Plantar Fasciitis (Policeman's Heel).**—Any occupation that entails much standing or walking predisposes to this condition, which is common in men of 40 to 60 years of age. Ossification extending into the posterior insertion of the plantar fascia gives rise to a calcaneal spur, which is easily demonstrated by radiography but is impalpable clinically. As the spur is often symptomless, and as 'policeman's

heel' is not infrequently encountered in a patient without such a spur, *the finding of a spur on X-ray examination is probably incidental*. The cause is thought to be plantar fasciitis which results in pain in the ball of the heel on walking or standing. There is considerable tenderness in the area, the most acute point being over the medial tubercle of the calcaneus (*Fig. 935*). Reiter's syndrome (*see p. 449*) is sometimes associated.

### THE TOES

In older patients always examine the foot pulses (*see p. 389*) before advising an operation on the toes. To advise a non-essential surgical procedure on a foot with a deficient arterial circulation is a grave error.

### THE GREAT TOE

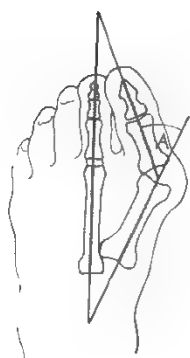
**Hallux\* Valgus.**—This common deformity, which usually is bilateral (*Fig. 936*), can be congenital or acquired. Especially in the congenital form, the proximal phalanx, in addition to being valgus, is often rotated so that its plantar aspect looks laterally. If so, in all but children, there is likely to be a callosity over the medial aspect of the great toe. Often, in both forms, the second toe comes to overlap or underlap the great toe, or the second toe is a hammer toe.

Ask the patient to move the great toe upwards—the extensor tendon stands out as a tight cord. In spite of the deformity the metatarsophalangeal joint has a good range of movement.

Very frequently the deformity, even a prominent deformity, is seen when examining the feet for other conditions, the hallux valgus being symptomless. When pain is due to the deformity it results from one or more of: (a) infection of an



*Fig. 935.*—Sites of plantar pain so typical as to suggest the diagnosis.



*Fig. 936*—A fairly early example of bilateral hallux valgus. For accuracy the degree of abduction of the toe on the metatarsal (A in diagram) should be measured.

\* *Hallux*. Latin = the great toe.

accompanying bunion (*see Fig. 73, p. 33*); (*b*) an accompanying hammer toe; (*c*) wide splaying of the forefoot giving rise to transverse flat-foot; (*d*) osteoarthritis of the metatarsophalangeal joint (*see below*). Inspection and seeking a tender place by pressure will quickly reveal which of these is the cause of the pain in a given case. Acquired hallux valgus, which is found almost invariably in women, is one of the penalties of wearing pointed shoes.

**Hallux Rigidus.**—When, during its period of growth, the great toe is subjected to stubbing from a too-short shoe, osteoarthritis of the metatarsophalangeal joint results, and the joint becomes stiff. The condition also can arise from a specific injury to the joint. The most troublesome cases are those in which the toe (often an unduly long great toe) is held rigidly in a position of plantar flexion.



*Fig. 937.*—Hallux rigidus. The patient has been asked to flex his great toe. Only the interphalangeal joint moves.

Characteristically, the great toe is not valgus. There is great diminution of movement in the metatarsophalangeal joint, extension being especially restricted and painful (*Fig. 937*). In extreme cases all movement of the joint is abolished; the condition then becomes relatively asymptomatic. In its more usual, less advanced, state, hallux rigidus, which is seen particularly in young men, gives rise to pain in the metatarsophalangeal joint, especially when walking uphill or over uneven ground. A characteristic sign is palpable irregularity at the joint-line caused by small osteophytic outgrowths on the dorsal articular edge of the metatarsal head.

While the following conditions usually are the prerogative of the great toe, on infrequent occasions they may affect one of the other toes.

**Gout.**—In males gout selects the first metatarsophalangeal joint with great frequency. The patient is awakened at night with acute pain. The joint becomes tensely swollen, dusky-red (*see Fig. 759, p. 448*), and exquisitely tender. Pitting-on-pressure can be obtained in the overlying skin. Suppuration never ensues. As a rule the diagnosis is easy. A bunion must be eliminated by the absence of hallux valgus (unusual in men), by searching for tophi (*see p. 81*), and in cases of real doubt by the blood uric acid level.

**Ingrowing Toe-nail (Onychocryptosis).**—There is excessive lateral growth of

the nail into the nail-fold, most probably first invoked by cutting off the corners of the nail, viz. —————→ instead of trimming the toe-nails straight across. The sharp lateral edge of the nail digs into, and lacerates, the nail-fold.



In the pocket thus formed, chronic infection becomes established and results in a purulent discharge. More often than not recurrent attacks of acute or sub-acute paronychia punctuate the course of this painful affliction. In cases of some



Fig. 938.—Ingrown toe-nail. A small excrescence of granulation tissue in the situation shown is characteristic.



Fig. 939.—Subungual exostosis. Inset: The radiograph of this case.

standing chronic infection of the hidden wound of the nail-fold proclaims itself by protuberant granulation tissue (Fig. 938). Nearly always situated on the lateral side of the great toe, the region of the lesion is so exquisitely tender that the patient will limp if he wears any form of footwear save a sandal.

**Subungual Exostosis** first makes its appearance beneath the distal half of the nail, which becomes pushed upwards and discoloured. Later the exostosis forces its way through the nail by breaking or distorting it, to reach the surface covered with a mass of granulation tissue (Fig. 939). The outgrowth is symptomless until it is traumatized, or becomes infected, when it occasions great pain.

In comparatively early stages, it is confused most often with *onychomycosis*,\* a fungus affection causing the nail to become discoloured, much thickened, brittle, and split longitudinally in several places. It may also be mistaken for an ingrown toe-nail. A lateral radiograph renders the diagnosis incontestable.

**Subungual Malignant Melanoma.**—Nearly always early cases are diagnosed incorrectly, being mistaken for a subungual haematoma or a fungus infection, and many months elapse before the correct diagnosis is made. A melanoma occurs as deep pigmentation of the nail bed, or as a pigmented nodule beneath the nail or in the nail groove. Usually in a matter of months, lively proliferation causes the nail to be lifted up, and lost. Then the growth ulcerates, and becomes secondarily infected, but it still retains some of its characteristic brown-black melanin. A similar lesion can occur beneath the thumb-nail.

**Onychogryphosis** (Ram's Horn Nail) (see Fig. 65, p. 29).

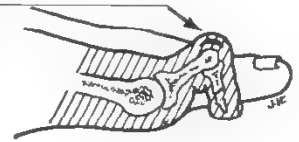
\* *Onychomycosis*. Greek, *ὄνυξ* = nail + *μύκης* = fungus.

**Glomus Tumour** is similar in all respects to that occurring beneath the nail of the upper extremity (*see* p. 490).

#### THE SMALLER TOES

**Hammer Toe.**—The proximal phalanx is extended; the middle phalanx is flexed; the distal phalanx can be either flexed or extended, usually the latter. The second toe is involved most frequently. The head of the proximal phalanx is subject to intermittent pressure and a corn, and often in this instance a bursa, too, occurs over the joint, viz.:

This deformity, which gives rise to much painful disability, is usually bilateral, but often a hammer toe or toes is more advanced on one side. Commonly hallux valgus is associated. The toe deformity in pes cavus (*see* p. 552) is similar but the metatarsophalangeal joint is flexed.



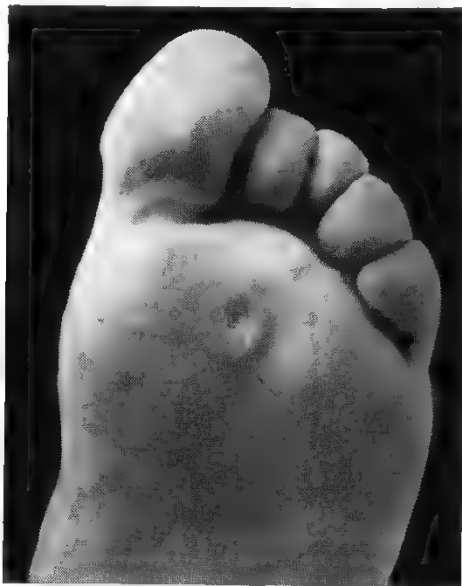
**Overlapping Fifth Toe** is a common congenital abnormality.

**Bunionette.**—In cases of splay foot (*see* p. 555) the fifth metatarsal bone is displaced away from the fourth, and consequently the head of the fifth metatarsal projects laterally, and is subjected to intermittent pressure from a tight shoe. So it comes about that this bony projection becomes cushioned by an adventitious bursa that is liable to attacks of inflammation. This adventitious bursa is very frequently misnamed 'tailor's bursa' which, in point of fact, is a completely different condition (*see* p. 547).

**Ainhum.**—A painful constricting groove encircles the base of the fifth toe, ultimately causing auto-amputation in an African who habitually walks barefoot (*see* Fig. 67 p. 30).

#### THE FOREFOOT

**Metatarsalgia.**—The term implies pain in the metatarsal region without an obvious cause such as a plantar wart. Thus, with greater clinical acumen, less frequent resort to the use of the word is necessary. Examination along the lines already laid down will detect flat foot (particularly of the transverse variety), plantar wart, soft corn, and hallux rigidus, all causes of pain in this region.



*Fig. 940.*—Plantar corn beneath the second metatarsal head in a case of congenital short first metatarsal.



*Fig. 941.*—Compression of the heads of the metatarsals.



**Tarsal Tunnel Syndrome.**—The cause is similar to that of the carpal tunnel syndrome (*see* p. 473), in this instance the posterior tibial nerve being compressed in the fibro-osseous tunnel deep to the flexor retinaculum behind and below the medial malleolus. However, the condition is very much less frequent and the sex incidence is equal. The patient complains of burning pain and tingling in the toes and the sole of the foot at night. Relief may be attained by hanging the foot out of bed in a dependent position but the foot pulses are present (*see* p. 389). As with the carpal tunnel syndrome a sphygmomanometer cuff pumped up to the systolic blood-pressure for a minute may reproduce the symptoms.

**Congenital Short First Metatarsal.**—This is a not uncommon anomaly. Weight-bearing is transferred from the first metatarsal head with its sesamoid bones on to the second metatarsal head. A corn extending deeply, almost to the bone, develops exactly beneath the second metatarsal head (*Fig. 940*) with localized tenderness.

**Pain in the Ball of the Big Toe.**—Tenderness strictly confined to this region implies disease of the weight-bearing medial sesamoid. Apley points out that this bone mimics the patella in its pathology. Thus, a fracture (rare), chondromalacia, or osteoarthritis may cause pain.

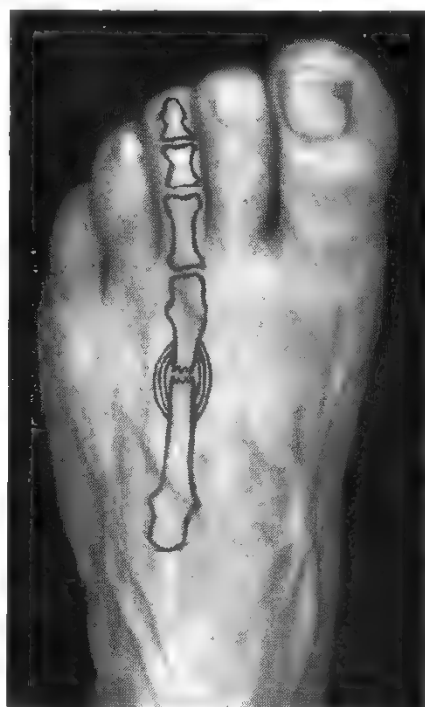
If none of the above are present proceed as follows: find the place that is most tender to digital pressure and confirm the exact point accurately by using a blunt object. Next exert transverse pressure across the metatarsal heads, as shown in *Fig. 941*, and observe whether this reproduces the pain. If so, one of the three following conditions is present. The age, occupation, and sex give a clue to the exact diagnosis, but radiography is necessary for confirmation.

**Morton's Metatarsalgia** is due to a neuroma of the medial plantar nerve's contribution to the third cleft, just before that nerve divides into its two digital branches. This is not a true neoplasm, but a granuloma probably due to intermittent pressure. The neuroma is rarely palpable through the skin. It gives rise to sudden, often extremely severe, pain that shoots into the toes supplied by the nerve (*see Fig. 935*) whenever the neuroma is subjected to pressure, as when walking over uneven ground. There is often plantar hyperaesthesia of the 3rd and 4th toes. Females are affected in the ratio of 4:1.

**Stress Fracture of a Metatarsal Bone** (March Fracture; Fatigue Fracture) occurs in the distal third of one shaft, most often of the 3rd metatarsal of the right foot, but sometimes infraction\* of another metatarsal (the 2nd, and the 4th or 5th rarely) occurs instead. This is a condition well known to military surgeons, but it occurs also in hikers and even in those, like hospital nurses, whose duties entail much standing.

The onset is undramatic. When the boots or shoes are taken off there is a cramp-like pain in the affected forefoot and moderate local oedema appears *on the dorsal aspect*. Move each toe in turn; that of the involved metatarsal causes pain, and when this bone is palpated from the dorsal surface a point of tenderness is found directly over the lesion. *Radiography at this stage is negative*, but the condition is diagnosed correctly by military surgeons without the aid of X-rays. In civil life it is seldom diagnosed for at least one, and sometimes several weeks, when, because of lack of immobilization, there is an excessive deposit of callus around the fracture (*Fig. 942*).

**Freiberg's Disease (Infraction\*)** is an affection of the head of the 2nd (rarely the 3rd) metatarsal bone that commences in the articular surface in the same way as osteochondritis dissecans (*see* p. 527). It is comparatively rare, with young women more frequently affected than other persons. In the beginning the condition is extremely painful. At this time there is some local oedema of the dorsum of the forefoot and exquisite tenderness over the affected metatarsal head when even light digital pressure is applied either from the sole or the dorsum. As time goes on, and the



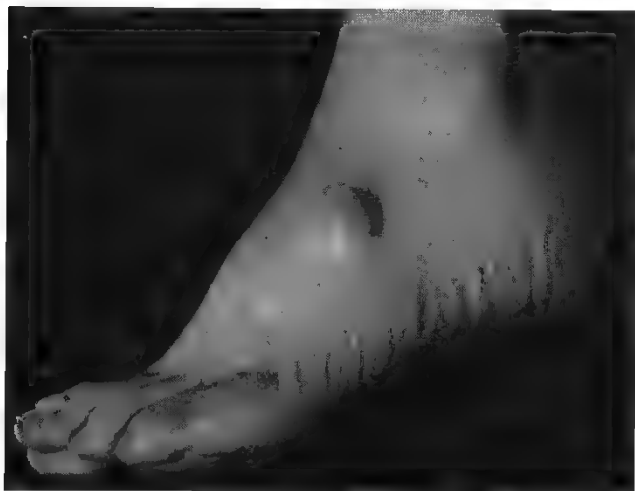
*Fig. 942.*—March fracture. The condition (excessive callus) 3 weeks after the fracture had occurred.

\* *Infraction*. Latin, *in* = into + *fractio* = break. Incomplete fracture without displacement.

metatarsophalangeal joint stiffens, the pain and tenderness become much less, but a bony lump (the thickened metatarsal head) can be palpated.

**The Dorsum of the Foot.**—The tarsal bones and joints (excluding the calcaneus) are comparatively accessible from the dorsal and medial aspects of the foot.

**Ganglion of the Foot** (*Fig. 943*) nearly always arises on the dorsum. Its characteristics are similar to those of ganglion of the wrist (*see p. 475*), but it is much less common.



*Fig. 943.*—Ganglion on the foot in a typical situation.

**Köhler's Disease** (Osteochondritis of the Navicular Bone) is an uncommon affection commencing in childhood about the fourth year. It causes a pronounced limp and a moderate degree of pain is located in the dorsal aspect of the foot. On palpation of the dorsum of the foot there is an area of tenderness (*Fig. 944*) limited strictly to the navicular bone. The radiographic findings are characteristic: the navicular appears as though it has been crushed.

*Fig. 944.*—Site of tenderness in Köhler's disease of the navicular bone. *Inset:* the typical X-ray appearances.



**Tuberculosis of the Tarsus.**—Pain is an early symptom, but usually it is not so severe as in a case of tuberculosis of the ankle-joint. Swelling of the dorsum of the foot is evident, and so is wasting of the corresponding calf muscles. Because of the complexity of the synovial membranes of the region, several tarsal bones become involved. Sinus formation is common.

### INFECTIONS OF THE FOOT

**Infections of the Sole of the Foot** are particularly common among those who walk barefooted and are thus seen mostly in the tropics. Apart from an infected

blister (which is also common in those who go about shod) the various infections of the sole are summarized thus:—

**Infection of a Web Space.**—These spaces, four in number, extend into the dorsal as well as into the plantar aspects of the foot, and are comparable in every way to those of the hand. Infection is not uncommon in diabetics. There is localized tenderness upon the dorsal, as well as the plantar, aspect of the web.

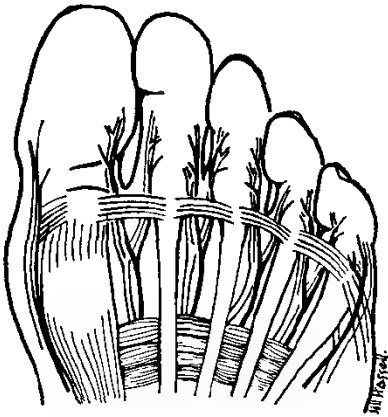


Fig. 945.—The four interdigital subcutaneous spaces between the five slips of the termination of the plantar fascia.

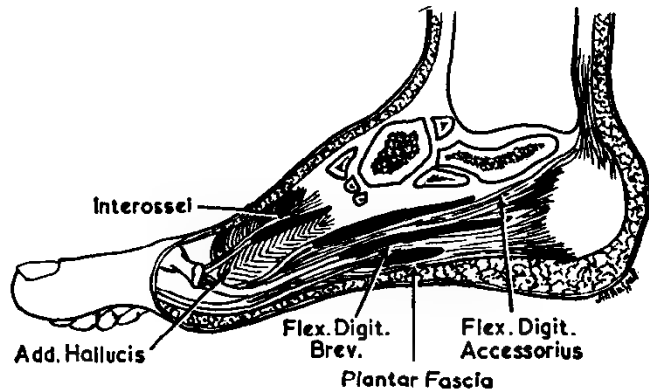


Fig. 946.—Sagittal section showing the four compartments of the central plantar space.

**Infection of an Interdigital Subcutaneous Space.**—There are four spaces lying between the five digital slips of the central fasciculus of the plantar fascia (Fig. 945). Commonly a space is infected by stepping on a thorn or a tack. The patient experiences increasing pain between two metatarsals; soon he is unable to walk. Exquisite tenderness over the infected space proclaims the diagnosis. A collar-stud abscess, with one abscess cavity lying within calloused skin and the other occupying an interdigital space, is present occasionally. When pus has decompressed itself into the dorsal subcutaneous space, localization of the abscess is more difficult.

**Infection of the Heel Space.**—The fat-pad is intersected by dense fibrous bands extending from the plantar fascia to the skin. The spread of infection from one subdivision to another is therefore slow. Throbbing pain, sufficiently severe to interfere with sleep, is the leading symptom. The patient dare not put his heel to the ground. Swelling of the soft tissues overlying one or both sides of the calcaneus is present. Some oedema around the ankle is usual. Acute tenderness over the space, and, later, fluctuation, leaves no doubt as to the diagnosis.

**Infection of the Deep Fascial Spaces of the Sole.**—There are three deep fascial spaces in the sole—medial, central, and lateral. The medial and lateral spaces are of subsidiary importance, for they are comparatively rarely infected. *The Central Plantar Space* is arranged like an apartment house of four storeys (Fig. 946). Infection of the various floors of the central plantar space becomes increasingly less common as one proceeds from the ground floor upwards. Infection can arise from a penetrating wound, but more frequently it results from extension from an undrained abscess of an interdigital subcutaneous space which spreads along the tunnel that accommodates the digital nerve. As in the hand, the most valuable guides to pus deep in the sole are swelling of the *dorsum* and tenderness

of the instep. That the instep is acutely tender serves to distinguish the condition from infection of an interdigital subcutaneous space. In infection of any of these spaces the concavity of the instep is obliterated and in late cases it assumes convexity.



Fig. 947.—Madura foot.

**Madura Foot\*** (*Mycetoma Pedis*), which is endemic all over the tropics and in many subtropical countries (even in temperate climates occasional cases occur, e.g., examples have been reported where the infection was acquired in California), is caused by a filamentous fungus that abounds in road-dust. In the early stage, especially if the sole is involved malignant melanoma may be suspected, but later like other invading mycotic infections, sinuses result (Fig. 947) giving rise to discharging 'granules' (clumps of the infecting fungus). These may be one of three varieties, known respectively as black, red, and yellow mycetoma, because of the colour of the granules. *Mycetoma pedis* is practically confined to those who go about barefooted, and in 9 cases out of 10 the infection is introduced by a prick, usually by a thorn. The first manifestation is a firm, painless, rather pale nodule, usually on the foot; it increases in size and others appear. In a matter of a week or more, vesicles appear on the surface of the nodules. Soon each vesicle bursts, to reveal the mouth of a sinus, which discharges purulent mucoid fluid containing the characteristic tiny granules. These are sought in the same way as described for actinomycosis (see p. 40).

*There is no lymphadenitis.* From now onwards the course of the disease differs according to the variety of mycetoma pre-

sent. In the black variety the infection spreads mainly subcutaneously. In the red and yellow varieties deep spread occurs early, and muscle and underlying bone become infiltrated, but, unexpectedly, nerve and tendons are highly resistant to invasion, and neurological signs are conspicuous by their absence. Blood-borne dissemination to other parts of the body does not occur. Sooner or later secondary infection supervenes and produces rapid deterioration of the condition. Gross swelling of the foot with obliteration of the concavity of the instep occurs, often with replacement of the concavity by a convexity.

**The Differential Diagnosis of Multiple Sinuses of the Foot** is a common problem in many tropical countries. A veritable host of infections can cause sinuses and basically the diagnosis depends on isolating the causative organism together with a knowledge of local endemic infections. Bear in mind that tuberculosis is common in the tropics and is often long untreated. Kaposi's sarcoma (see p. 29), in which the soft nodules often become infected, can resemble Madura foot clinically. Tropical ulcer (see p. 543) may occur on the foot.

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\* Due to the *Oöspora madurae* discovered by Hyacinthe Vincent in 1894.

## APPENDIX A

THIS section has been included to aid the student and newly qualified practitioner confronted with a patient requiring a relatively rapid but efficient routine of examination which will not skimp vital points. It is an attempt to supplement experience which is necessarily lacking. All the methods of examination are to be found earlier in the book, hence the cross-references.

### 1. THE NEWLY BORN INFANT

In England and Wales infant deaths due to congenital malformations now total approximately 20 per cent of all deaths in infancy (i.e., under 1 year of age). Many of these deaths are of course unavoidable; conversely, the best results for treatment of many congenital anomalies are attained only if the condition is diagnosed early. This applies particularly to neonatal intestinal obstructions (*see* p. 312), talipes (*see* p. 550), congenital dislocation of the hip (*see* p. 505), and spina bifida (*see* p. 204).

It is advisable therefore for the doctor who has newborn children in his care to apply a scheme of examination for each and every infant.

First, the naked infant should be *inspected*. Some defects which it is essential to remedy are easily seen, e.g. exomphalos (*see* p. 254) and meningomyelocele (*see* p. 204). Birth fractures are usually obvious.

Next the *anus* should be viewed, and in a few instances the little finger passed (imperforate anus, *see* p. 289). This may seem obvious, but, for want of this simple examination, cases of imperforate anus still present after the elapse of several days with advanced intestinal obstruction.

Tracheo-oesophageal fistula will be suspected on inspection if the signs detailed on p. 199 are remembered, particularly that of copious frothy saliva.

Lastly, perform the hip abduction tests (*see* p. 506) to exclude congenital dislocation of the hips, and observe the feet. If there is any suspicion of talipes, test whether the little toes can be placed on the shins (*see* p. 551).

Auscultation of the chest for murmurs indicating congenital heart disease is necessary, particularly if the baby is cyanosed, but this is beyond the scope of this work and, indeed, early diagnosis is not so essential.

**Conditions to be suspected in the First 12–24 Hours of Life.**—First and foremost is *neonatal intestinal obstruction* (*see* p. 312).

If very little or no urine is passed, obstruction by a posterior urethral valve is a possibility; examine for a full bladder (*see* p. 346).

**Cyanosis on Attempted Feeding.**—*See* p. 200.

### 2. EXAMINATION OF THE SEVERELY INJURED PATIENT

Unlike the slightly injured person who will usually indicate the injured part and state what has happened, e.g., a fall on the wrist, a cut finger, the severely injured patient may be unconscious, and the doctor will often have to rely on eye-witnesses or ambulance attendants to relate what has happened.

The first priority in examination is to determine by the methods outlined on p. 43 whether the patient is shocked. In a properly run Trauma Department a nurse will have placed a sphygmomanometer cuff around an upper arm before the doctor reaches the patient. The first blood-pressure reading and pulse-rate are an important base-line and should be followed by quarter-hourly recording of these data in all serious injuries.

Proceed then to examine the limbs for obvious signs of fracture of a long bone (*see* p. 441) and to question the patient, if possible, regarding pain in the back and elicit signs which might indicate a fractured spine (*see* p. 221). When the possibility of a fractured long bone or spine have been eliminated by clinical means, the nursing staff are asked to undress the patient completely,



if necessary cutting the clothes along the seams, to enable a full examination. It is wiser for the doctor himself to supervise this if there is suspicion or certainty of the above injuries.

Reverting to the apparently mildly injured patient, beware the patient who states that there is nothing wrong with him after a serious accident, and examine him most carefully, testing particularly for fractured ribs (*see p. 185*). Numerous instances have been reported, from Coroners' Courts, of patients allowed to leave hospital with multiple fractured ribs (not seen on, perhaps imperfect, X-rays), or with a ruptured spleen, or with cardiac tamponade. It is difficult to believe that proper application of the compression test will fail to elicit pain if several fractured ribs are present.

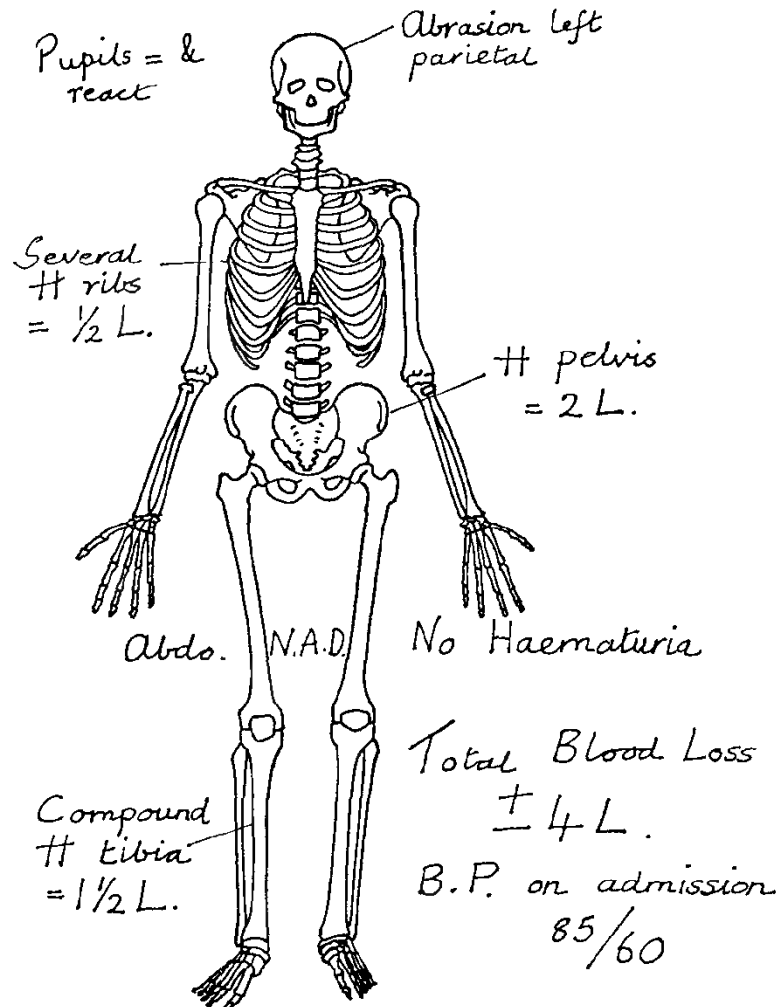


Fig. 948.—Pictorial record of a patient's injuries together with a rough calculation blood-loss. The symbol # denotes fracture.

When the patient is completely undressed the examiner should continue in an ordered manner. Apart from obvious fractures, all lacerations and bruises should be noted carefully, even if only for medicolegal purposes. It is useful and expeditious to make a graphic record utilizing a rubber stamp pad of the skeleton (*Fig. 948*). A logical sequence is as follows:—

*The Head* (*see p. 57*).—Remember that 60 per cent of accident deaths are due to head injury (*Rowbotham*).

*Fractures of the Facial Skeleton* comprise varying combinations of fractures of the zygoma (*see p. 69*), nose (*see p. 134*), maxilla (*see p. 93*), and mandible (*see p. 95*).

*The Thorax*.—Examine for fractured ribs, subcutaneous emphysema (*see p. 186*), pneumothorax, and cardiac tamponade (*see p. 189*). Check that both sides of the chest move equally (*see p. 196*).

*The Abdomen*.—In most cases a rapid palpation of the conscious patient's abdomen satisfies one that there is no intraperitoneal injury.

**The Urinary Tract.**—In relevant instances with trauma to the loins, lower rib cage, or pelvis, the patient should be asked to pass urine, which is examined for haematuria (*see* p. 337). Should the patient be unwilling or unable to pass urine the passage of a catheter in the operating theatre under full asepsis is mandatory.

**The Limbs.**—From the point of view of treatment, this is the optimum time to diagnose, or at least suspect, that the major limb artery has been disrupted by the injury. Examine the distal part of the limbs for signs of ischaemia (*see* pp. 395–7).

**The Spine** (*see* p. 223).

On concluding this detailed examination (and sometimes before), it is often more important to commence treatment for shock immediately, than to send the patient to the X-ray department for an investigation which usually only confirms what is already known.

**Diagnosis of the Extent of Blood-loss.**—The blood-loss in the first 24 hours after certain severe injuries is much greater than previously thought. The *average* figures (in adults) for various common *closed* fractures are given below. Compound fractures may show a much greater loss depending on the efficiency of first-aid treatment and the size of divided vessels.

Pelvis 2.0 litres.  
 Shaft of femur (including basal fractures) 1.0 litre.  
 Neck of femur 0.5 litre.  
 Shaft of tibia 0.75 litre.  
 Ankle fractures 0.5 litre.  
 Fractures around the knee with effusion 1.0 litre.  
 Shaft of humerus 0.5 litre.  
 Fracture-dislocation of elbow 0.5 litre.  
 Shafts of radius and ulna 0.5 litre  
 Colles's fracture 0.25 litre.  
 3–5 ribs (without haemothorax) 0.5 litre.

In each case reference to a pictorial record as in *Fig. 948* together with a simple arithmetical calculation will lead to an approximate estimate of the blood-loss, often before signs of shock are apparent. It is safer to err on the side of exaggeration of the extent of the haemorrhage in the first place.

**The Unconscious Patient.**—Make sure that the airway is unobstructed and insert an endotracheal tube if necessary. The problem of completely accurate diagnosis is much more difficult. In the majority, head injury is the cause of the loss of consciousness. It is important to have the whole scalp shaved as soon as feasible, for a bruise often overlies the fracture.

Even in patients with head injuries, hypoxia may be the factor which precipitates loss of consciousness. Examine carefully therefore for chest lesions and estimate the blood-loss due to other injuries. Bleeding into the skull is not an important factor in assessing blood-loss, but bleeding from a scalp wound is often quite copious.

Unless the patient is deeply unconscious, an abdominal injury can be detected by the fact that palpation seems to cause pain. Admittedly this is often a most difficult decision to make. Two physical signs are helpful (Lewin). Firstly seek shifting dullness in the flanks (*see* p. 250) and secondly auscultate the abdomen (*see* p. 309). Absent bowel-sounds suggest early peritonitis, i.e., that there is an intra-abdominal lesion.

Lastly, bear in mind that coma is due frequently to medical causes, and actually may have caused the accident. Diabetes, a stroke, alcoholic poisoning, and barbiturate poisoning are the common causes of coma. In suspected poisoning a, sometimes neglected, common-sense test is to look for a bottle in the patient's pockets. Many people now carry a card detailing their medication (anticoagulants, steroids) or disability (diabetes, haemophilia, etc.).

### 3. EARLY DETECTION OF CANCER

Although malignant disease is now much more frequent than serious infectious disease in many parts of the world, it is not yet a notifiable condition in Great Britain or any other large country with reasonably developed public health services. Thus any deductions as to the frequency of cancer have to be drawn from the only data available, namely, mortality statistics which are not of extreme reliability. In England and Wales malignant disease causes, at present, slightly over one hundred thousand deaths annually. In *Fig. 949* is shown the approximate percentage

frequency for the most important sites excluding reticulosis. It is with the early detection of these growths that the student and practitioner are most concerned.

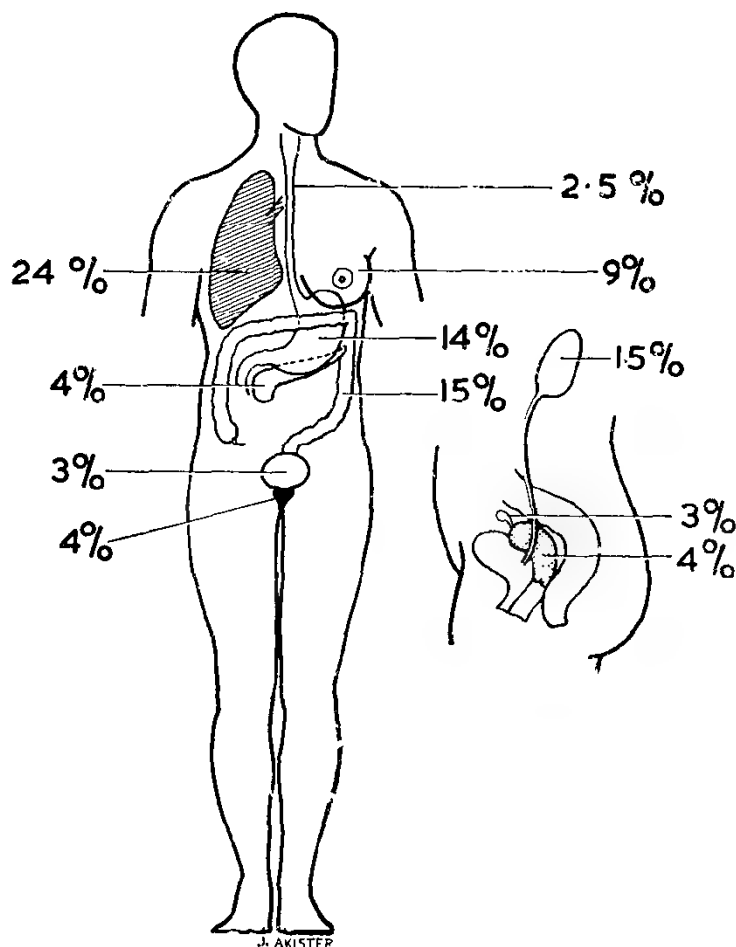


Fig. 949.—The frequency of cancer as the cause of death in England and Wales. Colon and rectum are grouped together (15 per cent), as are cervix and body of uterus (4 per cent). Note the comparative rarity of kidney (1.5 per cent) and thyroid and testis (not shown; only 0.4 and 0.2 per cent respectively).

**Alteration of Function.**—At the outset it must be stressed that the majority of potentially curable cancers present early with alteration of function and that to wait until physical signs are evident is often to procrastinate until long after the patient's chance of cure has vanished. Thus, one of the following complaints in the history should always be heeded and, in the absence of physical signs, should lead the clinician to request an appropriate X-ray examination and/or arrange to perform an endoscopy.

*Indigestion* of recent onset, particularly in an older person. Carcinoma of the stomach (*see* p. 233) must be excluded.

*Loss of appetite*—the same applies.

*Loss of weight* is found in the late stages of many malignant conditions (and in many other diseases) but, in the first place, suspect carcinoma of the stomach.

*Diarrhoea and/or relative constipation*, if of more than 2 or 3 weeks' duration, and in the case of the former not obviously infective in origin, should lead to a suspicion of rectal (*see* p. 284) or colonic carcinoma (*see* p. 247) until proved otherwise.

*Hoarseness or loss of voice*.—Suspect carcinoma of the larynx (*see* p. 134).

*Cough*.—Many smokers cough, and it is a recent alteration in the character of a cough which should induce suspicion and special investigation. Even a few flecks of blood noticed in the sputum is most significant. This is not the place to discuss the early diagnosis of bronchial carcinoma by bronchoscopy and radiology, but it is stressed that this is a highly malignant neoplasm and that presentation with metastases is frequent (*see* p. 194).

**Dysphagia.**—Carcinoma of the oesophagus (*see* p. 201) or of the hypopharynx (*see* p. 134) must be thought of.

**Abnormal Bleeding.**—The presence of blood in the excreta, or in a discharge from any orifice, or in the sputum, must be the signal for the instigation of a vigorous investigation along the lines laid down earlier in this work, namely:—

*Haematuria*—*see* p. 344.

*Rectal bleeding.*—Colonic, rectal, and anal neoplasms often bleed.

*Vaginal bleeding*—*see* p. 294.

**Haemoptysis.**—The importance of this sign has been stressed above in discussing carcinoma of the bronchus.

*Haematemesis* is unusual as the first sign of carcinoma of the stomach, but this sign must not be neglected lest a serious benign condition requires treatment.

*Epistaxis* is rarely due to a growth unless oft-repeated, but remember that nasopharyngeal neoplasms are common in some localities (*see* p. 133). Carcinoma of the maxilla (*see* p. 138) may present with nose-bleeding.

**Cancer presenting with Physical Signs.**—The most important are breast cancer (*see* Chapter XV), and ulcerating growths of the skin (*see* p. 33). An ovarian cyst (*see* p. 294) must be assumed malignant for there are no physical signs to prove the contrary.

Other important growths which usually can be detected clinically are:

Testicular tumours—*see* p. 379.

Uterine cancer—*see* p. 294.

In general, any swelling, unless obviously benign on clinical grounds (e.g., lipoma, ganglion, sebaceous cyst), should be removed and submitted for histology. Unless this is done, the clinician will occasionally commit a serious error of omission.

#### 4. FOLLOW-UP OF CANCER PATIENTS

Following treatment of malignant disease the conscientious clinician will observe the patient closely for at least 5 years if feasible, a good scheme being to re-examine him every 3 months for 2 years, then every 6 months for 3 years. All neoplasms can recur at any time although the likelihood decreases with the passing of the years. In general it can be said that, after 5 years free of recurrence, cure is probable, but there are exceptions to this rule, notably breast cancers which show a fairly high incidence of late recurrence. In this instance the patient should be seen at yearly intervals after 5 years for the rest of her life if practicable, particularly as the metastases are amenable to treatment.

A few conditions are so highly malignant that it can be said with a fair degree of confidence that, if the patient survives 3 years without evidence of recurrence, they are cured. Into this category fall most neoplasms in infancy and early childhood (nephroblastoma, *see* p. 353; neuroblastoma; and osteosarcoma, *see* p. 434).

##### The Follow-up Examination.—

Firstly, carefully scrutinize the *site of the primary growth*. Look particularly for nodules in, or a mass deep to, the operation scar, or for recurrent nodules, or a recurrent mass if treatment has been by radiotherapy.

Next examine the *regional lymph-nodes* if these are accessible and have not been removed as part of the operation:—

Axilla, *see* p. 177 for primaries in the breast, upper limbs, and bronchus.

Cervical, *see* p. 140 for head and neck, breast, and bronchus.

Supratrochlear, *see* p. 466 for upper limbs.

Groin, *see* p. 258 for lower limbs, external genitalia, anus, and rectum.

Popliteal, *see* Fig. 894, p. 531 for lower limbs.

Supraclavicular, *see* p. 140, particularly for intra-abdominal growths.

Lastly, the *abdomen* must be palpated for enlargement of the liver (*see* Fig. 446, p. 240) and tested for ascites (*see* p. 249).

In appropriate cases vaginal and/or rectal examination is necessary. This applies if the primary growth has been in the uterus or ovaries, or in the sigmoid colon, or if deposits of growth in the pelvis are suspected (*see* Blumer's rectal shelf and Krukenberg's tumours, p. 286).

**Weighing the Patient.**—All patients who have suffered from a major cancer (i.e., anything more serious than a rodent ulcer or skin epithelioma) should be weighed at each visit. Loss of weight without dieting (more than 2 kilograms) indicates that a very careful search must

be made for recurrence or metastases. A similar gain in weight should make the clinician suspicious of the development of ascites.

**Bone Metastases.**—Even in cancer patients pain can be caused by non-malignant conditions, e.g., cervical spondylosis, prolapsed lumbar intervertebral disk, and osteoarthritis of the knee, to mention a few common causes. If such a cause is not apparent, or if ordinary methods of treatment fail, consider a bone metastasis. If accessible, palpate the part carefully for local tenderness. If the metastasis is in a bone anywhere near the surface, the affected area is usually exquisitely tender. A swelling (*see Fig. 115*, p. 56) is exceptional, but a pathological fracture develops in a quarter of long bones which become the seat of a metastasis.

An X-ray of the part is mandatory, but remember that in some 10 per cent of cases the first radiograph is normal. Backache, particularly, is suggestive of metastasis, the vertebrae being the *first* site of half of bone deposits. Paraplegia complicates approximately 10 per cent of these.

**Detection of Deeply-seated Metastases.**—Deposits, initially clinically silent, affect the *lungs* in which metastases have to become remarkably diffuse before the patient becomes short of breath. A pleural effusion, which is probably at least as common, causes dyspnoea earlier. Dullness to percussion and absent breath-sounds are evident on the affected side.

**Brain secondaries** are commoner than primary brain tumours. Their localization is beyond the scope of this work, but the clinician should be on the look-out for changes in personality, paralyses, and cranial nerve palsy (*see p. 59*), particularly in patients who have had carcinoma of the bronchus.

**Reticuloses.**—The patient must be followed up for the rest of his life, as these conditions are, in the long run, almost inevitably fatal. Examination is directed specifically to all lymph-node areas (*see above*), and to the abdomen for enlargement of liver and spleen. Remember too that bone deposits ultimately occur in a small proportion (9 per cent).

**Further Primary Growths.**—Any patient who has had a cancer successfully treated is more liable to develop a growth than the average. The second growth may be in the contralateral organ (breast, bronchus, ovary, testis), remnant of the same organ (particularly colon), or in another organ.

## 5. SURGICAL DIAGNOSIS IN OLD AGE

There is no definition of old age, but it is a truism that a patient considered old by one observer would not be categorized as such by another. A good deal depends on the age of the observer! Be that as it may, the likelihood of the following remarks applying to any given patient is increased *pari passu* with his years and becomes of cardinal importance over the age of 70 years.

Surgical examination in an older person does not differ from that already described in this work but the older the patient the more likely that a given disease process is malignant (i.e., cancerous rather than sarcomatous) in aetiology. This might be termed the first principle of diagnosis in geriatric surgery. The second is that double, or triple, pathology is commoner with increasing longevity. Medical conditions (sometimes multiple) often accompany surgical disease and should be sought by routine methods of examination.

Although the possible combinations of disease are infinite in number, it is convenient to consider the commoner associations on a sexual basis:—

*In the male*, bear the following points in mind in conducting your general examination after examining the part of which the patient complains.

Inguinal hernia (*see p. 262*) is common.

Always inquire regarding frequency of micturition. It is as well to be aware of the degree of risk of acute retention of urine, should an operation prove advisable. If there is any degree of frequency assess the size of the prostate carefully by rectal examination (*see p. 366*).

*In the female*, be on the lookout for two important unobtrusive conditions:—

A small femoral hernia (*see p. 308*) which may, or may not be, the cause of abdominal symptoms.

A painless scirrhus carcinoma of the breast which an old lady is very liable to ignore.

In both sexes, *backache* is often due to secondary carcinoma, originating particularly in the breast or prostate. If these or other primary growths are absent, consider senile osteoporosis (*see p. 220*) as the cause.



## APPENDIX B

A LIST of tropical conditions demonstrating physical signs described in this work has been added for the benefit of students and surgeons in the Tropics.

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